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A.P.J. Abdul Kalam

The Visionary of India

K. Bhushan
G. Katyal

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Born on 15 October 1931 at Dhanushkodi in the Rameswaram district of Tamil Nadu, Abdul Kalam's father had to rent boats out to fishermen to pay this genius' school fees. He received secondary education at the Schwartz School, a missionary institute in Ramanathapuram, and later joined the St. Joseph's College at Tiruchirapalli, where he graduated with a Bachelor in Science. Abdul Kalam went on to study Aeronautical Engineering at the Madras Institute of Technology.

Even though a devout Muslim, his favourite pastimes include reading Hindu scriptures like the *Bhagvad Gita*, plucking the veena and writing poetry in Tamil, his first language. Unlike other great Indian Scientists, he was neither educated abroad, nor was his family financially very strong to support his academic pursuits. Branded as "200 percent Indian" by his colleagues and acquaintances, 'India's Missile Man', Avul Pakir Jainulabdeen Abdul Kalam has done the country proud on many fronts.

"Do things yourself. Do not indulge in short-cuts by importing equipment", thundered the great scientist after the famed Pokhran-2 nuclear blasts in 1998. A strong advocate of this philosophy, he distributed newspapers at a young age to help with household expenses.

Thoroughly Indian, the only brief exposure that he got abroad was in 1963–64 when he was invited by NASA (National Aeronautics and Space Administration) to spend four months in the United States at the Wallops Island Rocketry Centre and the Langley Research Centre.

Abdul Kalam joined the Defence Research and Development Organisation (DRDO) in 1958 and in his forty-year career as a scientist, achieved many milestones. He later joined the ISRO (Indian Space Research Organisation) where he succeeded in putting the 35-kg Rohini-I satellite on a low-earth orbit with help of the SLV-III (Satellite Launch Vehicle). After spending 19 fruitful years in ISRO, he returned to DRDO to head the country's Integrated Missile Development Programme, which culminated in the successful launch of the Agni and Prithvi missiles.

A great humanitarian, he extended his knowledge of space technology and mechanisms to help disabled children, replacing their 3-kg metal

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G.M. College of Education
Raipur, Bantalab
Jammu.
Acc. No. 4729 22 (IV)
Dated 16.5.03

K. Bhushan
G. Katyal

Reference Book

G.M.C.E.J
4729

A P H PUBLISHING CORPORATION
5, ANSARI ROAD, DARYA GANJ
NEW DELHI-110 002

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Published by
S.B. Nangia
A.P.H. Publishing Corporation
5, Ansari Road, Darya Ganj
New Delhi-110002
☎ 3274050
Email : aph@mantraonline.com

ISBN 81-7648-380-X

2002
Reprinted : 2002

© Editors

Printed in India at
Efficient Offset Printers
New Delhi-110 035

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PREFACE

A.P.J. Abdul Kalam

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"Do things yourself. Do not indulge in short-cuts by importing equipment", thundered the great scientist after the famed Pokhran-2 nuclear blasts in 1998. A strong advocate of this philosophy, he distributed newspapers at a young age to help with household expenses.

Thoroughly Indian, the only brief exposure that he got abroad was in 1963-64 when he was invited by NASA (National Aeronautics and Space Administration) to spend four months in the United States at the Wallops Island Rocketry Centre and the Langley Research Centre.

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Abdul Kalam joined the Defence Research and Development Organisation (DRDO) in 1958 and in his forty-year career as a scientist, achieved many milestones. He later joined the ISRO (Indian Space Research Organisation) where he succeeded in putting the 35-kg Rohini-I satellite on a low-earth orbit with help of the SLV-III (Satellite Launch Vehicle). After spending 19 fruitful years in ISRO, he returned to DRDO to head the country's Integrated Missile Development Programme, which culminated in the successful launch of the Agni and Prithvi missiles.

A great humanitarian, he extended his knowledge of space technology and mechanisms to help disabled children, replacing their 3-kg metal supporters with very light braces made of carbon, which weigh just 300 grams.

A vegetarian and a teetotaller, Abdul Kalam recites the *Quran* and the *Bhagvad Gita* with equal ease. A confirmed bachelor, his modesty is evident from the fact that he gives all the credit to his colleagues. He burst into the limelight after the Pokhran nuclear explosions in 1998. Totally dedicated to the development of the nation, he has been felicitated with many national awards. He was awarded the Padma Bhushan in 1981, the Padma Vibhushan in 1990 and the HK Firodia Award for Excellence in Science and Technology in 1996. More recently, he was honoured with the Bharat Ratna in 1997, the highest civilian award in India.

Abdul Kalam is a dreamer. He dreamt of a strong India. "We must think and act like a nation of a billion people." His next goal is to produce a reusable missile which no country in the world has been able to produce. And judging by his earlier achievements, this invention does not seem a distant possibility for this genius.

It is hoped that the present book will open a new area for future historians, researchers and the general public to know his leadership.

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1

LIFE AND ACHIEVEMENTS

Dr. A.P.J. Abdul Kalam is the father of India's indigenous missile program. His three visions for India—Freedom, Development and Self-Reliance, are arrived at on the basis of achievements and progress made by India, and during his own career as a missile scientist. Recipient of several awards including the Padma Bhusan (1981), the Padma Vibhushan (1990), he has been honored with India's highest civilian award, the Bharat Ratna (1997).

Activities

Abdul Kalam has specialized in Aero Engineering from Madras Institute of Technology Besides being a chairperson to Technology Information. Forecasting and Assessment Council (TIFAC), he has also been appointed Principal Scientific Advisor to the Government of India and accorded the rank of Cabinet Minister. He had contributed to a large extent to the development of the Satellite Launch Vehicle III, which injected She Rohini Satellite into orbit. At 70, he overlooks overall scientific development of the country on issues relating to scientific and technical policies in different sectors. He also advises on matters relating to technological self-reliance and foreign collaboration

Roots

Abdul Kalam was born on October 15, 1931, in a middle-class Tamil family at Dhanushkodi in Rameswaram district

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of Chennai. It is the capital city of the southern state of India. His father Jainulabdeen Marakayar was not a well-educated person, nor did he possess wealth in excess Mother Ashiamma, had gained much formal education. His father possessed great innate wisdom, true generosity of spirit and was a spiritual person. In a remote belt of a spiritually charged island town, at the southern tip, his father rented boats to fishermen.

Childhood

Abdul had a materially and emotionally secure childhood. Being the youngest in the family he was pampered a lot. His neighbors remember him as an introvert interested in reading. In the environment that he grew up books were a scarce commodity Mr. S.T.R. Manickam, his neighbour who encouraged him to read books, says "I used to have a library and Kalam was always there. He used to read everything he could lay his hands on."

He always used to eat, with his mother sitting on the floor. His decision to become a vegetarian was partly due to his financial constraints - but later on, he cultivated it as a habit Kalam believes that he has inherited honesty and self-discipline from his father, while faith in goodness and kindness is the trait inherited from his mother.

Early Experiences

Abdul Kalam considered himself lucky to come in contact with enough good people in life though Rameswaram was a highly stratified and rigid in terms of social segregation. He began his schooling at "Samiyar' school in Rameshwaram Sivasubramania Iyer his science teacher was a Brahmin with a very conservative wife. The rebel in Iyer, tried to break social barriers for people of varying backgrounds to mingle easily. One day, he invited Kalam home for a meal. His wife was horrified by the idea of a Muslim boy being invited to dine in her ritually pure kitchen She refused to serve Kalam in her kitchen. Sivasubramania Iyer didn't get angry nor was

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disturbed. Instead, he himself served Kalam and sat beside to eat his meal. His wife watched the conduct standing behind the kitchen door. While Kalam was to leave, Iyer invited him to join for dinner again the next weekend. When Kalam visited his house next week, his wife took Kalam inside her kitchen and served him food there itself. The orthodoxy, class and religious barriers were so prevalent that the society was divided in to classes as per the castes. The castes were divided on the basis of profession carried out by the person.

Touching Event

In another such incident, when he was in Vth grade at the Rameswaram Elementary School, there came a new teacher in the class. Abdul being a traditional Muslim wore a cap and sat in the front row, next to Ramanadha Shastry, a Hindu Brahmin who was wearing a sacred thread. The new teacher could not digest the fact that a Hindu priest's son was sitting with a Muslim boy. Kalam was asked to sit on the last bench. This incident was forever embedded in his memory.

Witness To Nature In Ail Its Fury

Kalam's father built wooden sailboats to ferry pilgrims to and fro, from Rameswaram to Dhanushkodi. He was also the Panchayat Board President of the village. Kalam overlooked the boat taking shape. Bulkheads and wooden hull were seasoned with the heat from wood fires. His father was doing good business with the boat, and one day, a cyclone struck the shore with winds blowing at over 100 miles per hour, which carried away their boats The Pamban Bridge also collapsed with a train full of passengers to speak of the havoc wreaked by nature. Till then, he had seen the calm beauty of the sea, but then, its uncontrollable energy came as a revelation to him.

A Life-Long Friend

Jallaluddin, a relative who later married Kalam's sister Zohara, became a good friend of Kalam. He would help his

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father at the boat building. In the aftermath of the tragedy, Jallaluddin, moved around with Abdul on long walks towards the sandy shores conducting spiritual discourses. Though Jallaluddins schooling had been limited, and it was perhaps, for this reason that he encouraged Kalam to excel at studies and equally enjoy Kalam's success. An interesting feature of his was that he (Jallaluddin) was the only person on the island who could speak and understand English. Abdul has expressed his gratitude to Jallaluddin for creating an awareness in him regarding "brave, new world", beyond the narrow confines.

Since early childhood, mysteries of the sky and the bird flights fascinated Kalam. He used to watch cranes and seagulls soar into sky. He was convinced that one day, he too would fly into the skies. He was the first person from Rameswaram to fly later indeed.

Another Influence

In 1939, World War II broke out, there was a sudden demand for tamarind seeds in the market. He used to collect the seeds and sell them to the provision store on Mosque street. A day's collection would fetch him an anna, the lowest of denomination then. After listening to stones of war from Jallaluddin, he attempted to trace the headlines in a periodical Dinamani. Though, their area was not much affected by the war. India as part of the Allied Forces, had joined the war and a state of emergency was declared then.

In all curiosity get an update on the war through pictures. Abdul would glance through the periodicals and newspapers before Samsuddin, his first cousin would go so deliver to the customers. Due to emergency, the train halt at Rameshwaram was stopped and the bundles of periodicals and news papers has to be dropped out of the moving train. Here, Samsuddin engaged Abdul, thus making earn his first pay, a matter he takes pride in, even today. He gives full credit to Samsuddin.

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Post-War Period

After World War II, Gandhiji declared "Indians will build their own India" and the country was filled with strong optimism. Abdul asked his father's permission to leave Rameswaram and study at the district headquarters in Ramanathapuram. Samsuddin and Jallaluddin traveled with him to Ramanathapuram to enroll Kalam at Schwartz High School. Kalam fell homesick and therefore, grabbed every opportunity to visit his hometown. It was his father's dream to see him as a successful person in the potion of a collector. This made him work hard and motivated him to fulfill his father's dream.

Growing Qualities Within

He was about 15, when he met his teacher Iyadurai Solomon - an ideal guide for an eager mind. Solomon raised Kalam's self-esteem and convinced him that the son of parents who had not had the benefit of education could also aspire to shape his life in the way he wished, because, through faith, anyone could change his destiny.

Once, when studying mathematics under Ramakrishna Iyer, Kalam was found loitering in the classroom; Iyer caught him by the scruff in front of the class. Few months later, he scored full marks in mathematics. Iyer narrated the incident to the entire school in the morning assembly saying that, whoever he caned became a great man. While at Schwartz, he grew up as a confident boy determined to succeed.

In 1950, he joined St. Joseph's College to study for the Intermediate examination at Tiruchirappalli. Kalam's brother Mustafa Kalam used to run a provision store on the railway station road. When Kalam used to go visit Rameswaram from Schwartz, Mustafa would vanish for hours together leaving the shop in charge of Kalam, who enjoyed selling novelties made of seashells. His younger brother Kasim, was also a salesman.

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Shaping His Career

While he was a final year student at St. Joseph, Abdul Kalam developed a taste for English literature. He started reading great classics by writers. Among them Scott, Tolstoy and Hardy were his favorites and later on, he moved to philosophy. It was during this period when he got interested in physics. Prof. Chinna Durai and Prof. Krishnamurthy, his physics teachers at St. Joseph's, introduced him to the concept of the half-life period and matters related to radioactive decay of substance through subatomic physics.

When he finished BSc, he was not aware of any other professional course. On completion of BSc from St. Joseph, he realized that engineering subjects were his favorite rather than physics. So he applied at the prestigious Madras Institute of Technology (MIT). Though selected on the merit list, it was an expensive affair for him to get enrolled. His sister Zohara stood by him, mortgaging her gold bangles and chain.

At MIT, two de-commissioned aircraft displayed for the demonstration of various subsystems of flying machines, fascinated him. He would sit for hours together observing them, even after other students left for their hostel. On completion of the first year, when he had to select a particular branch, he opted for aeronautical engineering. Here, he decided his goal to fly aircrafts. Prof. Sponder, Prof. K.A.V. Pandalai and Prof. Narasingha, were his teachers at MIT, who shaped his thinking and formed a foundation on which he built his professional career.

Prof. Sponder, was an Austrian who taught him technical aerodynamics, Prof. K.A.V. Pandalai, a very cheerful, friendly and enthusiastic teacher, taught aero-structure to Kalam, whereas, theoretical aerodynamics was taught by Prof. Narasingha Rao, a mathematician.

At the end of third year, along with four other colleagues, he was assigned a project to design a low-level attack

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aircraft. Kalam took up the responsibility of preparing and drawing its aerodynamic design, while his teammates took up the task of designing the propulsion, structure, control and instrumentation of the aircraft.

His design teacher Prof. Srinivasan, then the director of MIT, reviewed the project and declared Kalam's work to be gloomy and disappointing. He didn't lend an ear to his excuses. Kalam asked for a month's time to complete the task, but, the Prof. told him, "Look, young man, today is Friday afternoon. I give you three days time. If by Monday morning I don't get the configuration drawing, your scholarship will be stopped." Kalam could not respond as scholarship was his lifeline, and could not go ahead if it was taken away. There was no other way out but to finish the task. He didn't sleep that night, working on the drawing board skipping his dinner. On Saturday, he took just an hour's break and ate little. On Sunday morning, he was near completion, when he felt someone's presence in his room. It was Prof. Srinivasan watching his progress. After looking at his work, he patted his back and hugged him affectionately. He had words of appreciation : "I knew I was putting you under stress and asking you to meet an impossible deadline. I never expected you to perform so well."

The Dream

After completing his third year at MIT, Kalam joined Hindustan Aeronautics Limited (HAL), Bangalore as a trainee. Here, he worked on technical aspects of Aircrafts like piston, turbine engines, radial engine-cum-drum operations, checking crankshaft for wear and tear etc.

In 1958, when he came out of HAL as a graduate of aeronautical engineering, he had his long standing dream of flying, as two alternative opportunities for employment. One was the job at Directorate of Technical Development and Production (DTD & P) [Air] of the Ministry of Defense and another was a career in the Indian Air Force. He applied

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at both the places, and received interview calls simultaneously, from both. He had to reach Dehra Dun for an interview with Air Force recruitment authorities via Delhi, by DTD&P (Air) for the same.

He first went to Delhi for an interview with DTD&P (Air), which did not challenge his knowledge of the subject. Then, he proceeded to Dehra Dun for interview with the Air Force Selection Board. Here too, the interview was more on personality test, rather than testing his knowledge. He stood ninth in the batch of 25, and eight officers were selected to be commissioned in the Air Force. This was a disappointing, as he could feel the opportunity to join the Air Force slipping out of his hands.

Meets Swamiji

Kalam then visited Rishikesh where he bathed in the Ganga and met Swami Sivananda - "a man who looked like Buddha". He introduced himself to the Swamiji, to a no-reaction on his Muslim identity. He questioned Kalam for his sorrow and regrets in life. Kalam told him about his unsuccessful attempt to join the Indian Air Force and his long-cherished desire to fly. Sivananda guided him saying: "Accept your destiny and go ahead with your life. You are not destined to become an Air Force pilot. What you are destined to become is not revealed now but it is predetermined. Forget this failure, as it was essential to lead you to your destined path. Search, instead, for the true purpose of your existence. Become one with yourself, my son! Surrender yourself to the wish of God."

After returning to Delhi he received an appointment letter from DTD & P (Air). On the next day he joined as Senior Scientific Assistant, with a basic salary of Rs. 250/- per month. Here, he was posted at the Technical Center (Civil Aviation). He lost his resentment of failure, thinking he would be able to make aircrafts airworthy if not fly them. During his first year at the Directorate, he carried out a

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design assignment on supersonic target aircraft with the help of his officer-in-charge, R. Varadharajan, and won praise from the Director, Dr. Neelakantan. There from, he was sent to the Aircraft and Armament Testing Unit (A & ATU) at Kanpur to get shop-floor exposure in aircraft maintenance.

No Marriage Plans

He once told a friend, half-jocularly, that if he had married, he would never have achieved even half of what he has managed to. "When he was posted in Thiruvananthapuram, we almost fixed an alliance for him. But my wife and daughter fell ill and we got distracted by that. After that he left for Hyderabad," recalled Kalam's brother.

Team Man at DTD & P

Upon his return to Delhi, he was informed that the design of a DART target had been taken up at the DTD & P (Air) and he was included in the design team. After that, he undertook a preliminary design study on Human Centrifuge. He designed and developed a vertical takeoff and landing platform, and Hot Cockpit. Three years later, the Aeronautical Development Establishment (ADE) was formed in Bangalore and he was posted there.

Based on his preliminary studies on ground-handling equipment, a project team was formed to design and develop an indigenous hovercraft prototype as a Ground Equipment Machine (GEM). It was a four-member team of Scientific Assistants. Director of ADE, O.P. Mediratta, asked, Kalam to head the team and the engineering model was to be launched within the next three years.

The project was bigger than their collective capabilities as none of them had any experience in building a machine. They started working on a difficult project, to produce a wingless, light and swift machine. He could find metaphorical connection between a hovercraft and an aircraft. The then

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Defense Minister V.K. Menon showed keen interest in this project, which filled them with new enthusiasm. There were many who tried to discourage and dissuade them. During the project, the Defense Minister regularly visited ADE. After a few questions, it was decided that the prototype would go in test flight within a year. He told the Director: "GEM flight is possible with the gadgets Kalam now possesses."

The hovercraft was called Nandi, after Shiva's bull. It received a form beyond their expectation. The Defence Minister joined the test of Nandi, overruling the accompanying official's concern for his safety. They could complete the project prior to the deadline. The hovercraft was on an air cushion of about 40 mm with a load of 550 kg including the tare weight. Dr. Mediratta was visibly pleased with the project but Kalam was disappointed, as he could not obtain desired results.

Meeting M.G.K. Menon

After a few days, Mediratta called Kalam and inquired if the hovercraft was ready for flight. Some VIP were to visit the laboratory the next day. Next morning, Mediratta came with a tall, handsome and bearded visitor who asked Kalam several questions. He took a 10-minute ride in the hovercraft. He was Prof. M.G.K. Menon, Director of the Tata Institute of Fundamental Research, Mumbai (TIFR). Within a week, Kalam received an interview call for the post of Rocket Engineer from the Indian Committee for Space Research (INCOSPAR), about which, he later came to know that it was formed out of the TIFR talent pool at Mumbai to organize space research in India.

First Meeting with Sarabhai

The interview was held at Mumbai, headed by Dr. Vikram Sarabhai along with Prof. M.G.K. Menon and Mr. Saraf, the then Deputy Secretary of the Atomic Energy Commission. All of them were very polite, friendly and warm, as Kalam later recalled. He was absorbed as a rocket engineer at INCOSPAR.

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In 1962, INCOSPAR decided to set up the Equatorial Rocket Launching Station at Thumba, a sleepy fishing village near Thiruvananthapuram, Kerala. The site was selected as it was found suitable due to its geographical proximity with the earth's magnetic equator.

First Visit to NASA

Soon after, Kalam was asked to proceed to America for a six-month training program on Sounding Rocket Launching Techniques at the National Aeronautics and Space Administration (NASA) work centers. Before leaving India, he visited his family at Rameswaram.

India's First Rocket Launch Program

Kalam started working at NASA at the Langley Research Center (LRC) in Hampton, Virginia, which is primarily an R & D center for advanced aerospace technology. From LRC, he went to Goddard Space Flight Center (GSFC) at Greenbelt, Maryland. At the end of his visit, he went to the Wallops Flight Facility at Wallops Island in East Coast, Virginia. He was impressed by the American mentality of fighting in adverse situation. As soon as Kalam returned to India from NASA, India's first rocket launch took place on November 21, 1963. He was in charge of rocket integration and safety when the Nike-Apache was launched. The launch was smooth and problem free.

Dr. Sarabhai was happy with the successful launch of the Nike-Apache and was planning his future with Satellite Launch Vehicle (SLV). He asked Kalam to take up studies on a Rocket-Assisted Take-off System (RATO) for military aircraft. Dr. Sarabhai, an ideal experimenter and innovator, had great faith in his team under active collaboration with the USA, France and USSR. He could develop the rocket launch site at the Thumba Equatorial Rocket Launch Station (TERLS). The real journey of the Indian aerospace program, began with the Rohini Sounding Rocket (RSR) Program. The program was responsible for the development and

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fabrication of sounding rockets and their associated on-board systems for scientific investigations in India. Kalam was assigned the task of providing interface support to payload scientists. He had to interact with scientists from TIFR, National Physical Laboratory (NPL), and Physical Research Laboratory (PRL), besides scientists from the USA, USSR, France, Germany and Japan.

Providential Escape

Kalam had a colleague named Sudhakar, working in the Payload Preparation Laboratory. Once they were filling and remotely pressing the hazardous sodium and thermite mix. The climate of Thumba was hot and humid. After the sixth operation, both of them went into the payload room to confirm the proper filling of the mix. Suddenly, a drop of sweat from Sudhakar's forehead fell onto the sodium, and soon, there was a violent explosion, which shook the room. The fire was spreading fast and water cannot extinguish such fires. Sudhakar did not lose his presence of mind. He broke the glass window with his bare hands and threw Kalam out to safety before jumping out himself.

While working at TERLS, he was involved with rocket preparation activities, payload assembly, testing, evaluation, building subsystems like payload housing and jettisonable nose cones. As a natural consequence, he was led to the field of composite materials, working on cones. He used to read anything and everything available on related topics, particularly on glass and carbon Fibre Reinforced Plastic (FRP) composites.

Prime Minister Indira Gandhi's Visit to Thumba

In February 1969, Prime Minister Indira Gandhi visited Thumba to dedicate TERLS to the International Space Science Community. She commissioned India's first filament winding machine at their laboratory. Kalam, along with C.R. Satya, P.N. Subramanian and M.N. Satyanarayana, made high strength glass cloth laminates to build non-magnetic

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payload housings and test-flew them in a two-stage sounding rocket. They also wound and test-flew rocket motor casings of upto 360-mm diameter. The Indian payloads now, were no longer needed to be launched by French rockets as done earlier due to lack of infrastructure and technology. Two rockets Rohini and Menaka were built at Thumba. Under special attention and guidance of Dr. Sarabhai, the first Rohini-75 rocket was launched from TERLS on November 20, 1967. The following year, Kalam was called at Delhi along with Group Captain V.S. Narayanan at Hotel Ashoka by Dr. Sarabhai.

Dr. Sarabhai had planned to develop a Rocket Assisted Take Off system (RATO) for military aircraft, which could help our warplanes take off from shorter runways, especially in the Himalayas. By that evening, with the approval of the Prime Minister, India took up development of indigenous device to help assist short run take offs by high performance military aircraft based on Russian RATO system. Kalam was to head the project, which was completed within 18 months.

After detailed analysis of the available options, Kalam selected fibre glass motor casing. He also decided to take additional safety measures by incorporating a diaphragm - which would rupture if the chamber pressure exceeded twice the operating pressure. The release of a 10-year profile for space research in India, prepared by Dr. Sarabhai was the first work on RATO. This profile was a theme paper meant for open discussions, to be later transformed into a program.

The second development during the work on RATO was the formation of a missile panel in the Ministry of Defence. Both Kalam and Narayanan were inducted as members. They were very excited with the idea of making missiles on their own. Kalam had a new, young colleague, Jaya Chandra Babu, very positive in attitude and articulate too. At that time, Defence R&D, was heavily dependent on imported

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equipment. Kalam asked Jaya to find a way to be self-reliant. He said that the RATO system can be developed without imports, but its inherent inelasticity in the approach of the organization towards procurement and sub-contracting, which would be the two major thrust areas, had to be avoided. He asked for seven liberties including financial approval by a single person instead of an entire hierarchy. Air travel for all on work irrespective of their entitlement, accountability to only one person, lifting of goods by air-cargo, sub-contracting to the private sector, placement of orders on the basis of technical comparison, and expeditious accounting procedures. Though, such procedures remained unheard in government establishments, Dr. Sarabhai approved them without second thought.

Babu, with his uncommon sense in financial dealings, highlighted the importance of business acumen in developmental work with high stakes. They opted for a composite structure for the RATO motor casing using filament fibre glass. They had also gone in high energy composite propellant and an event based ignition and jettisoning system. On the 12th month of project initiation, they conducted the first static test of RATO.

Project Leader For SLV

In 1968, the Indian Rocket Society was formed. The INCOSPAR was reconstituted as an advisory body under the Indian National Science Academy (INSA) and the Indian Space Research Organization (ISRO) was created under the Department of Atomic Energy (DAE) to conduct space research in the country. Kalam was selected as project leader in Dr. Sarabhai's dream project of an Indian Space Launch Vehicle (SLV). Kalam was assigned the responsibility of designing fourth stage of the SLV, while Dr. V.R. Gowarikar, Kurup and A.E. Muthunayagam were assigned the tasks of designing the other three stages. The fourth stage was to be a composite structure and called for a large number of

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innovations in fabrication technology. He always considered the price of perfection prohibitive and allowed mistakes as part of the learning process.

Meeting Prof. Curien

One day, Dr. Sarabhai brought a French visitor Prof. Curien, President of CNES (Centre Nationale de Etudes Spatiales). Together, they helped Kalam set the target and continued doing so even in his failure. Prof. Curien advised Dr. Sarabhai to relieve Kalam from all the minor jobs, which posed little challenge and to give him more opportunities for higher achievement. He was so impressed that he thought of giving his Diamont airframe to Kalam. The Diamont and SLV air frames were incompatible. As diameters were quite different, radical innovations were required to attain inter changeability.

Kalam formed a habit of making notes on individual suggestions and gave handwritten notes to his colleagues in engineering and design, requesting concrete follow-up action within five to ten days. Their counterparts in Europe could barely manage in three years, which Kalam's team finished in a year's time. They modified SLV - IV stage design to suit the Diamont airframe. It was configured and upgraded from a 250 kg, 400 mm diameter stage to a 600 kg, 650 mm diameter stage. After two years of hard work, when they were about to deliver it to CNES, the French suddenly cancelled their Diamont BC program. They didn't need stage IV any more. This was a great shock for Kalam, as intense as his early disappointments at Dehra Dun when he failed to get into Air Force and at Bangalore, when the Nandi project was aborted at ADE.

With the course of time, RATO filled the vacuum created in Kalam by the Diamont BC stage. When the RATO project was underway, the SLV project slowly started taking shape.

In 1968, Dr. Sarabhai visited Thumba as his routine. He was shown the operation of the nose-cone jettisoning

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mechanism. Dr. Sarabhai pressed the button to activate the Pyro system through a time circuit. Nothing happened. Kalam and his team detached the timer device, giving direct connection to the Pyros. Once again the button was pressed. The pyros were fired and the nose-cone was jettisoned. Kalam asked for a single roof to carry out system integration of all rocket stages and rocket systems. It needed little effort to bring together the desperate work on electrical and mechanical integration. They decided to set up a Rocket Engineering Section that took birth in the failure of the timer circuit of a Rocket Engineering Laboratory.

Death of Dr. Sarabhai

On December 30, 1971, in Delhi, Kalam briefed Dr. Sarabhai regarding the Missile Panel meeting. Sarabhai instructed Kalam to wait at Trivandrum for him. When he reached Trivandrum, the aircraft ladder operator informed him that Dr. Sarabhai was no more. Kalam was shocked as he had conversed with Sarabhai just an hour ago. It was a great blow to Kalam and a huge loss to Indian science. Kalam considered Dr. Sarabhai as the Mahatma Gandhi of Indian science.

On October 8, 1972, the RATO system was successfully tested at Bareilly Air Force station in Uttar Pradesh. At that time, a high performance Sukhoi-16 jet aircraft became airborne after a short run of 1200 meters, as against its usual run of two kms. Kalam used 66th RATO motor in the test. This effort is said to have saved approximately 40 million Indian rupees in foreign exchange. The Indian RATO could be produced at Rs. 17,000 a piece, and it replaced the imported RATO, which cost Rs. 33,000.

Work Distribution of SLV-3

The Vikram Sarabhai Space Center was working on the SLV. This mega project lacked management structure to handle and coordinate activities, which had spawned in large number of place. Prof. Dhawan, in consultation with

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Dr. Brahm Prakash, selected Kalam for the job, appointing him as the Project Manager - SLV, and reported directly to the Director, VSSC. Kalam was determined to prevent people from taking either extreme, and to promote conditions where work and workers went together. The primary objectives of the SLV project were design, development and operation of a standard SLV system, SLV-3, capable of reliably and expeditiously fulfilling the specified mission of launching a 40-kg satellite into a 400-km circular orbit around the earth. A target of 'all line' flight test within 64 months was set in March 1973.

Kalam took up the responsibility of implementing the project within the framework of policy decisions taken, the approved management plan, and the project report, and also within the budget and through the powers delegated by the Director, VSSC. Kalam projected a requirement of 275 engineers and scientists for SLV-3 but could get only 50. Each member of SLV-3 project team was a specialist in his own field. Kalam faced urgent and conflicting demands on time as a leader executing the SLV-3 for committee work, material procurement, correspondence, reviews, briefings, and for the need to be informed on a wide range of subjects.

Kalam stressed three things to his colleagues - importance of design capability, goal setting and realization, and the strength to withstand setbacks. Kalam and his team decided to develop important technologies like welding techniques for low alloy stainless steel, electroforming techniques, and ultra-precision process tooling. They also decided to prepare few important machines in-house, like the 254-litre vertical mixer and the groove machining facility for the third and fourth stages.

SLV brought a new surge of activity in the development of a variety of transducers for measurement of physical parameters like pressure, thrust, vibration acceleration, etc. The SLV project also initiated the indigenous production of sequencers, which timed the various events, such as ignition,

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stage separation; vehicle altitude programmers, which store the information for the rocket maneuvers; and auto-pilot electronics, which take appropriate decision to steer the rocket along its pre-determined path. Without the energy to propel the whole system, a launch vehicle remains grounded. This team of almost self-trained engineers had within them untutored talent, character and dedication suitable for SLV.

Almost parallel to SLV, the Defense Research and Development Organization (DRDO) was preparing itself for developing an indigenous surface-to-air missile. On January 1, 1975, Kalam was taken on the DRDO team as a rocket specialist to evaluate the progress made in the areas of aerodynamics, structure and propulsion of the missile. They met at Defence Research and Development Laboratory (DRDL) on January 1 and 2, 1975, followed by the concluding meeting towards the end of March 1975 at Trivandrum.

Kalam clearly communicated the needs of his colleagues and insisted upon the financial freedom to the project team. Dr. Brahm Prakash, Director, VSSC, and a renowned metallurgist was taken aback by the bluntness of Kalam's submission. He stubbed his cigarette and walked out of the meeting. For the entire night, Kalam regretted the pain of his harsh words on Dr. Prakash. After giving a thought, Kalam arrived at a conclusion: "What would hurt Dr. Brahm Prakash more, my seemingly harsh words now, or the burial of the SLV at a later stage?" Dr. Brahm Prakash delegated financial powers to the project the next morning.

In 1975, ISRO became a government body. He came in contact with T.N. Seshan, the then Joint Secretary in the Department of Space (DOS). Till then, he had a latent reservation about bureaucrats. Hence, Kalam was initially not very comfortable to see Seshan participating in a SLV-3 management board meetings. First three years of the SLV project was the period of revelation of many fascinating mysteries of science. Kalam became aware of the difference

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between science and technology, between research and development. He says : "Science is inherently open-ended and exploratory. Development is a closed loop. Science is a passion, a never-ending voyage in promises and possibilities."

The SLV-3 project had been formulated in such a fashion that the major technology work centers, at VSSC and Sriharikota (SHAR) could handle production, rocket motor testing and launch of any large diameter rocket. Participating with SLV-3 project, they set three milestones for themselves:

1. development and flight qualification of all subsystems through sounding rockets by 1975;
2. sub-orbital flights by 1976 and;
3. the final orbital flight in 1978.

Though SLV-3 was not final, its subsystems were being finished. In June 1974, they used the Centaur Sounding Rocket Launch to test some critical systems. The test was a complete success. The first orbital flight by India was scheduled in 1978.

Journey with Von Braun

Kalam was to meet Wernher Von Braun, the man who conceived the lethal V-2 missile and was involved with rocket program at NASA and later he became the technical director of the German Missile Laboratory. Kalam was excited to travel with such a man who was a scientist, a designer, a production engineer, an administrator and a technology manager. Kalam was to escort him from Madras to Thumba. Braun observed the length to diameter L/D ratio of the SLV-3 and cautioned Kalam about the aero-elastic problems, which had to be avoided, during the flight.

Braun told Kalam, "SLV-3 is a genuine Indian design and you may be having your own troubles, but you should always remember that we don't just build on successes, we also build on failures." He further said that more hard work

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was not enough in rocketry, as it was not a sport where mere hard work can fetch honors. Here, one need not have to have a goal but, strategies to achieve it as fast as possible.

SLV was now a religion, a mission and God's purpose for Kalam, to be on earth. During those days, Kalam played no badminton in the evenings, nor on weekends or holidays. He had no family, no relations, nor any friends outside the SLV circle.

Kalam and Kurup : The Saviors

In 1979, a six-member team was preparing the flight version of a complex second stage control system for static test and evaluation. The team was in count down mode at T-15 minutes. One of the 12 valves failed to respond during the crucial check out sequence. Anxiety drove the members of the team to the test site to look into the problem. Suddenly, the oxidizer tank burst and Red Fuming Nitric Acid (RFNA), oozed out causing severe acid burns to the team members. Kalam, Kurup, and other scientists rushed to Trivandrum Medical College Hospital and begged to have their colleagues admitted, as six beds were not available in the hospital, at that point of time.

Sivaramkrishnan Nair was one of the injured. The first words he spoke after gaining consciousness were the words to express regret over the mishap and assured that he would make up for the slippage in schedules caused by the accident. This event enhanced Kalam's confidence in his team; a team that can stand like a rock against all odds.

Breaking of A Dream

On many days, Kalam and his team members skipped the lunch hour, without even realizing that they were hungry. Such a flow was experienced nearing the completion of the project. The SLV-3 dream was finally realized in the middle of 1979. Its first experimental flight was scheduled on August 10, 1979. The 23-meter long, four-stage SLV rocket weighing

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17 tons, finally took off elegantly at 0758 hours and immediately started following its programmed trajectory.

Stage I was a smooth transition of perfection to the second stage. They could see their dreams and hopes soaring in the form of SLV-3. Suddenly the spell was broken as the second stage went out of control. The flight was terminated after 317 seconds and the vehicle's remains, including fourth stage with the payload splashed into the sea. The incident fueled anger and frustration and overall disappointment. He could soon recollect his failure of Nandi, the abandoning RATO, the abortion of the SLV - Diamont fourth stage all like a long buried phoenix rising from its ashes.

Kalam addressed the meeting and Prof. Dhawan, "Sir, even though my friends have technically justified the failure, I take the responsibility for judging the RFNA leak detected during the final phase of countdown as insignificant. As a Mission Director, I should have put the launch on hold and saved the flight if possible. In a similar situation abroad, the Mission Director would have lost his job. I therefore take responsibility for the SLV-3 failure." Kalam was sad, but not in solitude as Dr. Brahm Prakash filled him with new confidence. Dr. Brahm Prakash taught him the traits and gave him a new perspective.

On July 17, 1980, 30 hours before the launch of the second SLV-3, the media buzzed with mixed reports. Some newspapers recalled the past failures while a few sounded positive about its success.

SLV-3 - Success at Last

On July 18, 1980, at 0803 hours, India's first Satellite Launch Vehicle, SLV-3, lifted off from SHAR. 600 seconds before the take-off, Kalam noticed the computer displaying data about stage IV giving the required velocity to the Rohini Satellite, carried as payload to enter its orbit. Within next two minutes, Rohini was set into motion in a low earth orbit.

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Kalam spoke the most important words he ever uttered in his life: "Mission Director calling all stations. Stand by for an important announcement. All stages performed to mission requirements. The fourth stage apogee motor has given the required velocity to put Rohini Satellite into orbit." There were happy cries everywhere. Kalam was lifted on the shoulders by his colleagues and earned in procession.

The entire nation was excited and proud of this indigenous effort. India entered into the small select group of nations, which possessed satellite launch capability. Media carried headlines and special programs. Parliament also congratulated with thumping of desks. It was a culmination of a national dream and the beginning of a very important phase in India's tryst in Space. The then Prime Minister, Indira Gandhi cabled her congratulations. Though Kalam was happy for the success, which eluded him for two decades, he was sad on the other hand, as all the people, his father, brother-in-law Jallaluddin and Dr. Sarabhai who inspired him were no longer there to share his success and joy.

Within a month of SLV-3 success, Kalam visited the Nehru Science Center in Mumbai for a day, in response to an invitation to share his experiences with the SLV-3. He had to rush back to Delhi to attend a meeting with Prime Minister Indira Gandhi. Kalam was hesitant because of his simple clothes, and slippers, and not by any standards of etiquette, a suitable attire, to meet the Prime Minister. But Prof. Dhawan said to Kalam, 'You are beautifully clothed in your success."

At a meeting of select 30-members of the Lok Sabha and Rajya Sabha, Mrs. Gandhi spoke about the success of the SLV-3 and lauded their achievement. She asked Kalam to address the gathering. Hesitantly, Kalam responded, "I am indeed honored to be in this great gathering of nation-builders. I only know how to build a rocket system in our country, which would inject a satellite, built in our country, by imparting to it a velocity of 25,000 km per hour."

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As Project SLV-3 had been successfully completed, Ved Prakash Sandlas was made the Project Director for the SLV-3 Continuation Project. The development of Augmented Satellite Launch Vehicles (ASLVs) had been on cards, for quite some time. The aim was to enhance the SLV-3 payload capability from 40 kg to 150 kg. MSR Dev was appointed Project Director of ASLV. To reach the sun-synchronous orbit (900 km), a Polar satellite Launch Vehicle (PSLV) was to be made. The Geo Satellite Launch Vehicle (GSLV) was also envisaged, and Kalam was then appointed the Director, Aerospace Dynamics and Design Group.

Kalam and his team established the SLV-3 solid rocket system and the national requirements of payload delivery vehicles for short and intermediate ranges of 4,000 km. The development of one additional solid booster of 108-m diameter with 36 tons of propellant along with SLV-3 sub systems would meet the Inter Continental Ballistic Missile (ICBM) requirement above 5,000 km for a 1,000-kg payload. Though, this proposal was never considered, it paved the way for the formulation of the Re-entry Experiment (RER), which later, became Agni - the precursor to the ambitious Indian missile program.

The next SLV-3, SLV-D, took off on May 31, 1981. This time, Kalam saw the flight from the visitor's gallery. Republic Day, 1981, came up to him as a pleasant surprise. On the evening of January 25, he came to know about the Home Minister's announcement about the conferment of the Padma Bhushan honor to Kalam, and Padma Vibhushan honor to Prof. Dhawan. Dr. Brahma Prakash congratulated him saying, "I feel as if my son has got the award." Kalam was deeply touched by Dr. Brahm Prakash's affection and could not hold on his emotions for a long period. He filled his room with the music of the famed Bismillah Khan's shehnai. He imagined visiting Rameswaram and hugging his mother, feeling his father's hands run over his head, Jallaluddin announcing the news to the crowd gathered on Mosque street, Zohara

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preparing special sweets for him, Fr. Solomon blessing him holding the holy cross and Dr. Sarabhai, smiling at him with a sense of achievement.

Kalam's Padma Bhushan evoked mixed reactions at VSSC. There were a few who shared his happiness, while others felt, that he was being unduly singled out for recognition, a sad but a fact true, in case of every success.

Prof. Ramanna, renowned nuclear scientist, wanted Kalam to work for DRDO, whereas, ISRO was little hesitant to relieve him. In February, 1982, the decision was taken to appoint Kalam as Director, DRDL. Kalam joined DRDL on June 1, 1982. His initial period at DRDL was largely interactive. In order to draw a clear and well-defined missile development program for the production of indigenous missiles, a committee was constituted under Kalam's chairmanship.

Family Commitments

He and his team members drafted a paper for the perusal of the Cabinet Committee for Political Affairs (CCPA). The estimated expenditure was about Rs. 390 crore, spread over a period of 12 years. Through this fund, Kalam wanted to develop two missiles - (1) a low-level quick reaction Tactical Core Vehicle and (2) a medium range Surface-to-Surface weapon system. They planned to make a surface-to-air medium range weapon system with multi-target handling capability during the second phase. They proposed a third generation anti-tank guided missile to have 'fire-and-target' capabilities. Kalam longed to revive his buried dream of a Re-entry Experiment Launch Vehicle (REX). He handed over his proposal to the Defence Minister of India.

While working for hours at a stretch, he forgot that it was his niece Zammela's wedding at Rameswaram that evening. It was quite impossible to reach Rameswaram the same evening due to lack of transport facilities. A pang of guilt dampened his spirits. How far was it allowed to forget one's family commitments and obligations ? Zammela was like a

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daughter to Kalam. The thought of missing her wedding because of professional pre-occupations at Delhi, was really distressing. In a meeting with the then Defence Minister Venkataraman, Dr. Arunachalam referred to Minister about Zameela's wedding. The Defence Minister arranged for an Air Force helicopter to carry Kalam to Madurai from Madras as soon as he reached there. The Air Force helicopter landed dose to the waiting Indian Airlines aircraft as soon as it arrived from Delhi. Thus, Kalam was in Rameswaram in time for Zameela's wedding. He could bless his brother's daughter with fatherly love.

The Defence Minister put up the anti-tank guided missile proposal before the Cabinet and saw it through. His recommendations on the proposal were accepted and an unprecedented amount of Rs. 388 crore sanctioned for the Integrated Guided Missile Development Program (IGMDP). The proposed projects were in accordance with the spirit of India's self-reliance. Thus, the Surface-to-Surface weapon system was shaped as Prithvi (the earth) and the Tactical Core Vehicle was called Trishul (the trident of Lord Shiva). The Surface-to-Air defence system was named Akash (sky) and the anti-tank missile project was called Nag (cobra - the poisonous snake), and Agni (fire) to his long cherished dream of REX. On July 21, 1983, Dr. Arunachalam arrived at DRDL and formally launched the IGMDP. After July 18, 1980, the SLV-3 launched Rohini satellite into orbit. This was the second most significant day of Kalam's career.

In less than four months, 400 scientists began to work on the missile program. The most important task for Kalam was the selection of the Project Directors to lead individual missile projects. He wanted five project directors to train another 25 project directors and team leaders for the future. He found them in form of Col. V.S. Sundaram of EME Corps, Indian Army to lead Prithvi, Cmde. S.R. Mohan, Defence R & D, Indian Navy to lead Trishul, R.N. Agarwal to lead Agni, Prahalada and N.R. Iyer to lead Akash and Nag. His

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desire was to be true to his way of life, to uphold science and rocketry in India and to retire with a clear conscience.

On January 3, 1984, evening news of Dr. Brahm Prakash's death came through. It was a great emotional loss for Kalam. Dr. Sarabhai was the creator of VSSC and Dr. Brahm Prakash, was the executor. Kalam's association with Dr. Prakash was a turning point in Kalam's life.

India of His Dreams

On June 26, 1984, the flight test of the first indigenous strap-down Inertial guidance system took place. After installing a make-shift launcher, the modified and extended range Devil missile was fired. Prime Minister Indira Gandhi expressed her desire to personally appraise the progress of the IGMDP. On July 19, 1984, Mrs. Gandhi visited DRDL. Kalam said : 'When India carried out its first nuclear explosion for peaceful purposes, we declared ourselves the sixth country in the world to explode a nuclear device. When we launched SLV-3 we were the fifth country to achieve satellite launch capability. When were we going to be the first or second country in the world to achieve a technological feat ?"

While they were working on the action plan emerged from the earlier review, news of Mrs. Gandhi's assassination broke. For Kalam, death of Mrs. Gandhi was very ominous. Her death was a tremendous loss to the scientific community. Her son Rajiv Gandhi became the new Prime Minister of India. By summer 1985, all the groundwork for building the Missile Technology Research Center at Imarat Kancha had been completed. On August 3, 1985, Prime Minister Rajiv Gandhi laid the foundation stone of the Research Center Imarat (RCI).

Within a week, Kalam left for the USA with Dr. Arunachalam on an invitation from the US Air Force. Roddam Norasimha from National Aeronautical Laboratory and K.K. Ganpathy of HAL also joined them. After finishing their work at Pentagon, in Washington, they landed at San Francisco

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on their way to Los Angeles to visit Northrop Corporation. Taking the opportunity, Kalam visited Crystal Cathedral built by his favorite author, Robert Schuller. Here, Kalam prayed to God to help him build a Research Center at the Imarat Kancha, which would be his Crystal Cathedral.

Around 280 young engineers changed the dynamics of DRDL. On September 16, 1985, the first launch of the Missile Program was conducted, when Trishul took off from the test range at SHAR. There were more than 500 scientists working for the Agni. Many organizations were now networked to undertake this huge effort of launching Agni. The Agni mission had two basic orientations of work and workers. Each member was dependent on the others in his team to accomplish his target.

Agni - The Launch Hazards

April 20, 1989 was scheduled to be the Agni launch date. A missile launch involves wide-ranging safety measures to be undertaken with due care on pre and post launch. Three telemetry stations, two radars, one tele-command station and four Electro-optical tracking instruments to monitor the missile trajectory had been deployed. The telemetry station at Car Nicobar and the SHAR radars were also commissioned to track the vehicle. Dynamic surveillance was employed to cover the electrical power that flows from the missile batteries within the vehicle and to control system pressures.

The specially designed automatic checkout system would signal 'Hold', if any deviation be noticed either in voltage or in pressure. The flight operations would be rescheduled only if the defect was rectified. The countdown for the launch began at T-36 hours. The countdown from T-7.5 minutes was to be computer controlled. All activities prior to the launch were according to schedule. At the time of launch, people living in nearby villages were asked to move to safer places. The media took up the chance to rake up much

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controversy. Foreign pressure was exerted through diplomatic channels to abort the flight trial, but the Indian government stood as a rock and slaved off any distraction in the launch. Suddenly, when they reached T-14 seconds, the computer signaled 'Hold', indicating that one of the instruments was functioning erratically. The defect was immediately rectified. Meanwhile, the down-range station asked for a 'Hold'. In few other seconds, multiple Holds were necessitated, resulting in irreversible loss in internal power connection. This was sufficient to abort the launch.

Nagaraj and his other team members were in a state of shock and sorrow. Kalam shared his failure of SLV-3, which brought them back to retrieve the sub-systems and re-charged them. The press was once again up in arms and interpreted the postponement of the flight in various ways. A cartoonist showed one Agni scientist explaining that the launch was postponed as press button did not make contact. A shopkeeper returning a product to the salesman saying that like Agni, it would not take off, was showed by cartoonist Sudhir Dar. 'There's no need for any alarm... its a purely peaceful, non-violent missile," said a leader to reporters of *The Hindustan Times*.

On May 1, 1989, the missile was once again ready for launch. This time also, during the automatic computer check out period at T-10 seconds, a Hold signal was indicated. A closed inspection displayed that one of the control components, S1-TVC was not working according to the mission requirements. Once again the launch was to be postponed. Keshav, The Hindu among other vernacular and English language newspapers carried a cartoon showing a villager counting some currency notes and commenting to another, "Yes, it's the compensation for moving away from my hut near the test site - few more postponements and I can build a house of my own". One cartoonist derogated Agni as IDBM as Intermittently Delayed Ballistic Missile, and

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Amul's (a national Butter brand) cartoon suggested that Agni should use their butter as fuel.

The entire DRDL - RCI community assembled after working hours on May 8, 1989. Kalam addressed more than 2,000 persons, he said, "I promise you, we will be back after successfully launching Agni before the end of this month. Hundreds of scientists and staff worked continuously and completed the system readiness with acceptance tests in just 10 days. The aircraft took off from Trivandrum with the rectified control system and landed close to ITR on the 11th day. A cyclone threat was looming large. All the work centers were connected through satellite communication and HF links. Meteorological data started flowing in at 10-minute intervals. Finally, the launch was scheduled for May 22, 1989. Dr. Arunachalam, Gen. K.N. Singh and Kalam along with Defence Minister K.C. Pant were walking on the previous night of launch. Defence Minister asked Kalam, "What would you like me to do to celebrate the Agni success tomorrow?" Kalam replied, "We need 100,000 saplings to plant at RCI." Once again Kalam was buying blessings of Mother Earth for Agni.

Next day, Agni took off at 7:10 hrs. It was a perfect launch. This was one of the greatest moments in Kalam's life to launch a missile after five years of continuous work at multiple work centers. Prime Minister Rajiv Gandhi called the Agni launch "a major achievement... though Agni is a reflection of our commitment to the indigenous development of advanced technologies for the nation's defence. The country is proud of your efforts" - he said to Kalam. President Venkataraman cabled from Simla, "It is a tribute to your dedication, hard work, and talent."

Gary Milhollin, had made a claim in The Wall Street Journal that India had made Agni with the help of West Germany. A denial come from the DLR, who in turn speculated that France had supplied the Agni guidance electronics.

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American Senator Jeff Bingaman said that Kalam picked up everything needed for Agni during his four-month stay at Wallop's Island in 1962. Kalam had been to Wallop's before 25 years and at that time the technology used in Agni did not exist even in the US. Amidst criticism and raised eyebrows from abroad, with Agni, India had reached the stage where it had the option of preventing wars. Agni marked the completion of five years of IGMDP, with a stable deterrent in place.

In September 1989, Kalam was invited by the Maharashtra Academy of Sciences in Bombay to deliver the Jawaharlal Nehru Memorial Lecture. There he shared his plans of making an indigenous Air-to-Air missile, Astra.

The second flight of Prithvi at the end of September 1988 was also a great success. Prithvi has proved to be the best surface-to-surface missile in the world today. It can carry 1,000 kg of nuclear capable warhead to a distance of 250 km and deliver it within a radius of 50 meters.

Decorated by Padma Vibhushan

On Republic Day 1990, India celebrated the success of its missile program. Kalam was conferred the Padma Vibhushan along with Dr. Arunachalam. J.C. Bhattacharya and R.N. Agarwal who were also decorated with the Padma Shree. Love and respect from his countrymen gave him immense satisfaction, even more than what the monetary benefits could ever fetch!

Kalam met his school teacher Iyadurai Solomon when he visited Madurai to deliver the convocation address at Kamraj University. Solomon told him : "You have not only reached my goals, Kalam! You have eclipsed them." The next month he had been to Trichi and visited St. Joseph's College.

The 44th Independence Day of India was celebrated by test firing Akash missile towards the end of 1990. Jadavpur

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University conferred Kalam the honor of Doctor of Science at a special convocation in the same year. Kalam's name was referred to along with the legendary Nelson Mandela, who too was honored at the same convocation. Kalam was embarrassed with the idea as his mission of advancing rocketry in India was perhaps nothing when compared with Mandela's mission of achieving dignity for a great mass of humanity, but there was no difference in the intensity of their passions.

The Five-fold Success

The Missile Council declared 1991 the year of Initiative for DRDL. On the night of January 15, 1991, Gulf War broke out between Iraq and the Allied Forces led by the USA. The successful test firing of Prithvi and Trishul during the course of the war was enough to make an anxious nation relax. On conclusion of the Gulf War with the victory of the technologically superior Allied Forces, over 500 scientists of DRDL and RCI gathered to discuss issues that had emerged. Kalam questioned the assembly: 'Was technology or weapon symmetry with other nations feasible, and if so, should it be attempted? .... How to establish effective electronic warfare support? How to make missile development proceed apace with the development of equally necessary systems like the LCA; and what were the key areas where a push would bring progress ?" At the end of the discussion for three hours, the consensus emerged that there was no way to redress asymmetry in military capability except to have the same capability in specific areas as the potential opponent. The scientist vowed to achieve a reduced CEP in the accuracy of Prithvi's delivery, perfecting the band guidance system for Trishul and realizing all carbon - carbon re-entry control surfaces for Agni by the end of the year and that was successfully done. The same year also witnessed tube-launched Nag flights, and the maneuver of Trishul at seven meters above sea level, at a speed that exceeded three times the speed of sound. Kalam received an honorary

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degree of Doctor of Science in the same year from the prestigious Indian Institute of Technology (IIT), Mumbai.

Later Years

On October 15,1991, Kalam turned 60 and looked forward to retirement. He had planned to open a school for the under privileged children after retirement. Prof. Rama Rao, heading the Department of Science and Technology, Government of India, was also interested in partnership to establish the Rao-Kalam school. But they had to postpone their plans as neither of them were relieved from their posts by the Government of India.

It was this period when Kalam started writing about the circumstances and people who made him what he is today. The idea was not merely to pay tribute to some individuals or highlight certain aspects of his life, but he wanted to say that no one, however poor, underprivileged or small, need feel disheartened about his/her life. Problems are a part of life and suffering is the essence of success. He writes: "I will not be presumptuous enough to say that my life can be a role model for anybody; but some poor child living in an obscure place, in an underprivileged social setting may find a little solace in the way my destiny has been shaped. It could perhaps help such childrer liberate themselves from the bondage of their illusory backwardness and hopelessness. Irrespective of where they are right now, they should be aware that God is with them and when He is with them, who can be against them ?"

Kalam says that the biggest success of IGMDP is not that in specific time, India acquired the capability of making fine state-of-the-art missile systems but, through it, some superb teams of scientists and engineers have been created. He has achieved in creating an environment for teams of young people to put their heart and soul into their missions. Kalam attempted to add the natural law of Latency by laying the foundation of the Indian Guided Missile Program to

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create a completely indigenous variety of technology management.

HIGHEST CIVILIAN HONOR

The year 1997 Bharat Ratna, India's highest civilian honor was awarded to Kalam, by the then President of India Dr. Shankar Dayal Sharma. This is a rare honor in recognition of his invaluable contribution, leading the country in the 21st century, with pride and humility. The country has done all it could but the man - has and wants a long way to go. He is determined to ignite the minds of children from the ninth to the twelfth grades as he feels the need to harness and nurture their budding potential. This now is the new pasture in his life which will surely meet 'soaring and roaring' success. He has a 5-point vision for India and that is:

1. India should produce 350,000,000 tons of food grains.
2. Optimize energy production and satisfy all requirements to the maximum level.
3. Provide excellent medical and educational facilities.
4. To utilize information technology for all round development.
5. To take gigantic strides in core sectors like Defence, Nuclear and Space Technologies.

This is the story of the period ending with the first Agni launch, and the receiving of the Bharat Ratna award. But life will still go on, for India will make great strides in all fields. Kalam, the son of Jainulabdeen - who lived for over a hundred years on Mosque street in Rameswaram island: a boy who sold newspapers to help his brother; a pupil trained by Sivasubramania Iyer and Iyadurai Solomon; a student taught by teachers like Pandalai; an engineer spotted by M.G.K. Menon and groomed by legendary Dr. Sarabhai; a scientist tested by failures and setbacks; a leader supported by a large team of brilliant and dedicated professionals.

This biography would end with Kalam, as he has no inheritance in the worldly sense - no family of his own. He

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writes: "I do not wish to set myself as an example to others, but I believe that a few souls may draw inspiration and come to balance that ultimate satisfaction which can only be found in the life of the spirit. God's providence is your inheritance. The bloodline of my great - grandfather Avul, my grandfather Pakir, and my father Jainulabdeen may end with Abdul Kalam, but this grace will never end, for it is Eternal."

Personal Moments

Kalam's brother-in-law and mentor, a childhood friend, a companion of life in its ups and downs, Ahmed Jallaluddin passed away. For a few minutes, Kalam became immobilized, could not think, feel or speak anything. Along with Jallaluddin - something within him also died. He felt as if thrown into a whirlpool of time and space. Kalam, traveling overnight, arrived at Rameswaram to help Zohara, her 4-year-old son Mehboob and his 100-year old father. Kalam felt himself drowning in a sort of anxious agitation. His involvement in SLV gradually, helped him overcome that period of loss and mourning.

During those days he had a wonderful friend, Y.S. Rajan from the ISRO headquarters. This friendship taught him to embrace turners, fitters, electricians and drivers with equal warmth as to scientists, engineers, contractors and bureaucrats. Now, when press calls Kalam 'welder of people' - Kalam attributes this to Rajan.

In 1976, his father passed away. He was not keeping well for quite some time due to his old age. He died at 102. The death of Jallaluddin had also affected his health and spirit. His mother could not live on this earth without Jainulabdeen, his father.

The SLV-3 Apogee rocket, developed as a common upper stage with Diamont, scheduled to be flight tested in France, was plagued by a series of problems. As he was about to leave for France to sort them out, he was informed about his mother's sad demise. Instead of France, he rushed

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to Rameswaram. Kalam went to a mosque after performing last rites of his mother. He knew that his mother could not live without love and care of her husband and therefore, followed her husband. Nobody spoke, yet he could hear loud and clear words within him : "They carried out the task I designed for them with great care, dedication and honesty and came back to me. Why are you mourning their day of accomplishment? Concentrate on the assignments that live before you and proclaim my glory through your deeds!"

At a Glance

Dr. Avul Pakir Jainulabdeen Abdul Kalam - 'a 200 per cent Indian', as his colleagues call him, has made India proud in myriad ways. 'We must think and act like a nation of a billion people and not like that of a million people. Dream, dream, dream ! Conduct these dreams into thoughts, and then transform them into action," said the man who dreamt for India, and acted on its behalf to place her in the exclusive Space Club. He wove a first world dream for the third world nation. He is a vegetarian and teetotaler, who recites the *Quran* and the *Bhagwad Gita* with equal devotion and has an unparalleled career as a defence scientist to be crowned with the highest civilian award of India - The Bharat Ratna.

As the Scientific and Technology Advisor to the Prime Minister of India, he propelled India into the select club of Missiles possessing countries. He recently resigned from the post to take up a more ambitious program of teaching and creating scientific temper in the minds of young inquisitive and knowledge thirsty Indians. His potent- concoction to 'hurl' India in the Super Power Countries Club, 'Vision 2020', spells nothing short of a revolution at grass-root levels.

His 'mantra' or gospel for India are; 'freedom, development and stand up to the world'. After the Pokhran blast, *Bombay Times* labeled him as **The Missile Man.** The English translation of his poem Tumult reads:

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Quotations

Climbing to the top demands strength, whether it is to the top of Mount Everest or to the top of your career.

- To live only for some unknown future is superficial.
- I was willing to accept what I couldn't change.
- There are forces in life working for you and against you. One must distinguish the beneficial forces from the malevolent ones and choose correctly between them.
- As a child of God, I am greater than anything that can happen to me.
- We should not give up and we should not allow the problem to defeat us.
- Great dreams of great dreamers are always transcended.
- Be more dedicated to making solid achievements than in running after swift but synthetic happiness.
- Those who cannot work with their hearts achieve but a hollow, half-hearted success that breeds bitterness all around.
- To succeed in your mission, you must have single-minded devotion to your goal.
- Man needs his difficulties because they are necessary to enjoy success.
- You have to dream before your dreams can come true.
- Life is a difficult game. You can win it only by retaining your birthright to be a person.
- Do we not realize that self respect comes with self reliance ?
- God, our Creator, has stored within our minds and personalities, great potential strength and ability. Prayer helps us tap and develop these powers.
- The Earth is the most powerful and energetic planet.

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Chronology

Oct. 15, 1931	Born at Rameswaram.
1950	Kalam joined St. Joseph College, Trichi for BSc. degree.
1954	Joined Madras Institute of Technology (MIT).
1958	Employed at DTD & P (Air) as Senior Scientific Assistant.
1962	INCOSPAR took the decision to set up the Equatorial Rocket Launching Station at Thumba.
Nov. 21, 1963	India's 1st rocket Nike - Apache launched.
Nov. 20, 1967	Rohini - 75 rocket was launched from TERLS.
1968	Formed the Indian Rocket Society.
Dec. 30, 1971	Death of Dr. Sarabhai
Oct. 8, 1972	Successful testing of the RATO system Sukhoi-16 jet aircraft performed.
1974	Death of his brother-in-law, Jallaluddin.
1976	His father Jainulabdeen passed away at the age of 102. Soon afterwards his mother also passed away.
July 18, 1980	India's first Satellite Launch Vehicle, SLV-3 lifted off from SHAR.
Jan. 25, 1981	Padma Bhushan award announced.
May 31, 1981	Next SLV-3-D, took off.
Feb. 1982	Appointed Director of DRDL.
July 27, 1983	IGHDP launched.
June 26, 1984	Devil missile was fired to flight test the first indigenous Strap-down Inertia Guidance System.
August 3, 1985	Foundation stone of the Research Center. Imarat (RCI) was laid down.

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Sept. 1988	Second flight of Prithvi.
May 22, 1989	Agni missile launched.
Jan. 26, 1990	Conferred the Padma Vibhushan.
1990	Jadavpur University conferred him the honor of Doctor of Science.
1991	Received an honorary degree of Doctor of Science from IIT, Mumbai.
1997	APJ Kalam awarded the highest civilian honor of India : the BHARAT RATNA.
May 11, 1998	India conducts nuclear tests at Pokhran Rajasthan.
June 10, 2002	NDA picks Kalam for President.
June 13, 2002	Congress backs Kalam for President's post.
June 18, 2002	Kalam files nomination papers for President's post.

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2

THREE VISIONS FOR INDIA*

Abstract

Dr. APJ Abdul Kalam, the father of India's integrated guided missile program, states three visions for India based on the achievements and progress that he has witnessed in the history of the nation and during his own career as a missile scientist. Dr. Kalam's three visions for India are FREEDOM, DEVELOPMENT, and STAND UP. The focus of his presentation is on developing India to its fullest potential, while standing up to the rest of the world with fully validated self-respect for the achievements that have been obtained in the modem time.

If we are not free, no one will respect us

I have three visions for India. In 3,000 years of our history, people from all over the world have come and invaded us, captured our land, and conquered our minds. From Alexander onwards the Greeks, the Portuguese, the British, the French, the Dutch - all of them came and looted us and took over what was ours. Yet we have not done this to any other nation. We have not conquered anyone. We have not grabbed their land, their culture, and their history, nor tried to force our way of life on them. Why? Because we respect the freedom of others.

* Dr. A.P.J. Abdul Kalam, 10/8/98

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That is why my first vision for India is FREEDOM. I believe that India had its first vision of freedom in 1857, when we started the War of Independence. It is this freedom that we must protect and nurture and build on. If we are not free, no one will respect us.

My second vision for India is DEVELOPMENT. For 50 years, we have been a developing nation. It is time to see ourselves as a developed nation. We are among the top five nations of the world in terms of gross domestic product (GDP); we have 10 per cent growth rate in most areas.

Our poverty levels are falling, and our achievements are being globally recognized today. Yet we lack the self-confidence to see ourselves as a developed nation - self-reliant and self-assured. Isn't this right?

India must stand up to the world

I have a third vision, that India must STAND UP to the world, because I believe that unless India stands up to the world, no one will respect us. Only strength respects strength. We must be strong not only as a military power, but also as an economic power - both must go hand-in-hand.

My good fortune has been to work with three great minds: Dr. Vikram Sarabhai of the Department of Space, Professor Satish Dhawan, who succeeded him, and Dr. Brahm Prakash, father of nuclear material. I was lucky to have worked with all three of them closely, and consider this the great opportunity of my life.

I see four milestones in my career. One is the 20 years I spent in ISRO. I was given the opportunity to be the project director for India's first satellite launch vehicle, SLV-3, the one that launched Rohini. These years played a very important role in my life as a scientist. Two: After my ISRO years, I joined DRDO and got a chance to be part of India's guided missile program. It was my second bliss when Agni met its mission requirements in 1994.

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Three: The Department of Atomic Energy and DRDO had this tremendous partnership in the recent nuclear tests, on May 11 and 13, 1998. This was the third bliss, the joy of participating with my team in these nuclear tests and proving to the world that India can make it, that we are no longer a developing nation but one of them. It made me feel very proud as an Indian the fact that we have now developed for Agni a re-entry structure for which we have developed this new material, a very light material called carbon-carbon.

Why is the media here so negative?

One day an orthopaedic surgeon from Nizam Institute of Medical sciences visited my laboratory. He lifted the material and found it so light that he took me to his hospital and showed me his patients. There were these little girls and boys with heavy metallic calipers weighing over 3 kg each, dragging their feet around. He said to me, "Please remove the pain of my patients." In three weeks, we made these floor reaction Orthosis 300 g calipers and took them to the orthopaedic center. The children didn't believe their eyes - from dragging around a 3 kg load on their legs, they could now move around. Their parents had tears in their eyes - that was my fourth bliss.

Why is the media here so negative? Why are we in India so embarrassed to recognize our own strengths, our achievements? We are such a great nation. We have so many amazing success stories, but we refuse to acknowledge them. Why? We are the second largest producer of wheat in the world. We are the second largest producer of rice. We are the first in milk production. We are number one in remote sensing satellites. Look at Dr. Sudarshan, he has transferred the tribal village into a self-sustaining, self-driving unit. There are millions of such achievements, but our media is obsessed only with bad news and failures and disasters.

DO we not realise that self-respect comes with self-reliance?

I was in Tel Aviv once, and I was reading the Israeli newspaper. It was the day after a lot of attacks and

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bombardments and deaths had taken place. The Hamas had struck. But the front page of the newspaper had the picture of a Jewish gentleman who in five years had transformed his desert land into an orchid farm and granary. It was this inspiring picture that everyone woke up to. The gory details of killings, bombardments, and deaths were inside the newspaper, buried among other news. In India, we read only about death, sickness, terrorism, and crime. Why are we so negative?

I want to live in a developed India

Another question: why are we, as a nation, so obsessed with foreign things? We want foreign TVs, we want foreign shirts, we want foreign technology. Why this obsession with everything imported? Do we not realize that self-respect comes with self-reliance?

I was in Hyderabad giving this lecture, when a 14-year-old girl asked me for my autograph. I asked her what her goal in life is. She replied, "I want to live in a developed India." For her, you and I will have to build this developed India - you must proclaim!

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ABDUL KALAM : 200 PER CENT INDIAN

A.P.J. Abdul Kalam, whose name has been proposed by the National Democratic Alliance as the next President of India, remembers being fascinated by the flight of seagulls on Rameswaram island where his father was a boat builder.

Fate, his dreams of turning India into a developed nation, and the influence of a teacher were to play a seminal role in the making of the father of India's guided missile programme who is likely to become the eleventh President of the Republic.

Dr. Kalam, 71, who has been described as '200 percent Indian' by his colleagues in the scientific community, has done the country proud on many fronts.

A grateful nation honoured him with the 'Bharat Ratna', the country's highest civilian award, in 1997.

Published accounts quote Kalam about his emotions at the time of Partition when he saw two photographs on the front page of a newspaper _ one of Nehru unfurling the flag, and the other showing Mahatma Gandhi, the Father of the Nation, walking in Noakhali in Bengal, because of the communal riots there.

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'You would normally expect the Father of the Nation to be at the flag-hoisting in the capital, but no, he was far away, removing the pain of the people.

'That taught me something about our culture that no university education could have," said Kalam, who was in high school when India attained Independence.

A strong believer in self reliance, freedom and development, Kalam is a dreamer to the core.

"Dream, dream, dream. I conduct these dreams into thoughts and then transform them into action," said the man who dreamt for India and acted on its behalf to place it in the exclusive space club of countries which launch satellites.

Dr. Avul Pakir Jainulabdeen Abdul Kalam, was born on October 15, 1931, at Rameswaram in Tamil Nadu.

As a schoolboy, he used to distribute newspapers to help meet the family expenses.

He did his B.Sc., at the St. Joseph's College, Tiruchi, and DMIT in Aeronautical Engineering at the MIT, Madras, during 1954-57.

He joined the Defence Research and Development Organisation in 1958.

During 1963-82, he served the Indian Space Research Organisation in various capacities.

As Project Director, SLV-3, he was responsible for carrying out design, development, qualification and flight testing of 44 major sub systems.

In 1982, as Director, DRDO, he was entrusted with the Integrated Guided Missile Development Programme.

He conceived the programme, constituting five major projects, for meeting the requirements of the defence services and for establishing re-entry technology.

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But his biggest contribution was in propelling India into the select band of missile-possessing countries when he was the Scientific Adviser to the Prime Minister.

'We must think and act like a nation of a billion people and not like that of a million people," he said once.

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A.P.J. Abdul Kalam, India's Leading Defence Scientist on Pokhran II : Vision 2020*

How the West denigrates Indian Science

One aspect, which is interesting, is how, whenever India achieves something that is commendable, the developed nations tend to trace it to some know-how, equipment or manpower that was provided by the West. For instance, in July 1980, when we launched our first satellite launch vehicle and put the Rohini satellite into orbit, India became one of four nations to have a satellite launch facility. But within a week, a news item originated from the USA saying that I had had a few months' training at NASA and that is where I picked up the technology that was used for the launch. This was supported by the rest of the western press. In Germany they claimed that the wind tunnel test was carried out in their facility, and so they had indirectly enabled the launch. When we heard the news about the reactions of the Western scientists, technologists and the press, the general response of my team of scientists and technologists at the Vikram Sarabhai Space Centre, Trivandrum, was one of great amusement. We knew that thousands of scientists, engineers and staff had worked on the project from the drawing board

* APJ Abdul Kalam and Y.S. Rajan.

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to the development stage and right through till the launch. The technology was completely indigenous.

The SLV used proportional control for its first stage control systems with a sharing logic software. This was a first in the world. Similarly, we had made other innovations in comparison to any launch vehicle at that point of time. As for the Scout, the American satellite launch vehicle from which our technology was alleged to be lifted, only the fifth launch of the Scout had proved successful. In comparison, our second, third and fourth launches were all successful. This is a pointer to the technological strength of our nation.

Again, when I was involved in the Guided Missile Programme and we successfully launched the Prithvi missile several times, the Western press including some of our own analysts insisted that we were using Russian technology. In fact, Prithvi had a distinctive design, using a particular gyro system with a uniquely configured software, which nobody in the world had tried; when the flight is in progress, the drift can be monitored through the on-board computer. It had other innovations too: the type of thrust termination is so innovatively configured that for a multiple payload, multiple ranges can be achieved. Today, Prithvi is comparable to any world class missile system, and probably is the best of its class in payload capability. Let us come now to a third, very important milestone, namely Agni. We launched Agni in 1989 and it was successful. We have so far done three launches. Surprisingly, again, there were two claimants who wanted to take credit for the success. Germany said that their guided system which was used for scientific experiments in India had gone into the making of Agni. And the USA claimed again that my NASA training was responsible for Agni. Actually, in Agni, there were innovations made in the guidance technology. We can manoeuver the payload and the complete re-entry hypersonic flow was simulated in the Computational Fluid Dynamics in one of the best computers that we ourselves had designed. The re-entry structure, in

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fact, has used a specially designed material to withstand the 3500 degree C heat generated upon re-entering the atmosphere. It is really amusing that the Americans think that it is only with their technology that India can succeed.

Recently two departments, the Department of Atomic Energy and the DRDO, working in an excellent partnership, tested several nuclear devices in Pokhran. Three tests were carried out simultaneously; there were two more tests subsequently. We had excellent results, well reported universally by nearly 125 seismic stations. This indicates that India had reached the stage of nuclear Europeanization. We were extremely happy with our achievement. But the next day we found the Western press alleging that Israeli technology had gone into the triggering system of the nuclear device. There was also the familiar accusation that the scientists and technicians who had visited the USA had helped India achieve this breakthrough. This was puzzling because nobody in the world has used the type of triggering mechanism we have developed. Multiple innovations have gone into the nuclear technology and nuclear device testing area. In all four of these cases, I was fortunate to be continuously involved directly or indirectly in various teams of ISRO, DAE and DRDO.

I find myself asking why in spite of innovative and excellent design capabilities in India, an impression is created by the West that no one other than the developed nations can achieve such technological excellence. Just as there has been a racial element in human history, it would appear that this element is entering into the technological arena too. Developed nations feel that only they are capable of developing certain types of aerospace, missile and nuclear technology. But we should ignore this and go ahead with our technology development.

(Excerpted from India 2020, -with the publisher's permission.)

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AGNI 'COULD BE DEPLOYED WITHIN THREE MONTH'

Despite the announcement earlier this month that India's Agni Intermediate Range Ballistic Missile (IRBM) had been put on hold, sources in the Indian Defence Research & Development Organisation (DRDO) claim that the missile could be made operational within three months if the political climate so warranted.

On December 5, 1996 India's all-party Parliamentary Defence Committee made public a Defence Ministry report that claimed that the Agni was "a re-entry technology demonstration project which has been successfully completed..." The report added that "The decision to develop and produce a missile system based on Agni technology, however, can be taken at an appropriate time consistent with the prevailing threat perception and global or regional security environment."

However according to a report in the December 12 issue of the English-language Delhi Business Standard, the Agni could rapidly be assembled by a production team Bharat Dynamics Ltd (BDL) in Hyderabad.

"If a decision is taken, it won't take long to prepare the missile for launch," the DRDO source told the *Business Standard.*

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The DRDO source added that was absurd to believe that the Agni was built merely to demonstrate "re-entry" technology. It was intended as an offensive weapon system and nothing else.

Significantly, the source claimed a fuel-air explosive (FAE) warhead had been developed for the Agni. Such a warhead would make the Agni potentially far more destructive than if it was armed with a conventional high-explosive warhead. A pre-fragmented charge warhead, intended to destroy structures and vehicles in the target area, had also been developed.

Reaction to the government's December 5 announcement has been mixed. However in its December 11 Editorial, the Calcutta Telegraph strongly supported the decision to put the Agni on hold:

The key to understanding the do's and don'ts of Agni lie in asking who this missile can be aimed at and what sort of weaponry can it carry. Its range is so long it is quite useless against Pakistan. Its most obvious target would be China, but the arc of Agni's range would embrace Russia, Saudi Arabia and Iran. Agni, like most IRBMs, is too inaccurate to be armed with conventional warheads. It has military utility only if it carries atomic explosives.

Deploying Agni, therefore, means aiming a nuclear missile against China. At any time, but especially now when relations with Beijing are on the upswing, to take such an unprovoked but clearly hostile stance would be an act of unparalleled mindlessness. And no matter what New Delhi's hawks may claim there is no evidence China has targeted nuclear missiles at India. Instead there are plenty of verbal reassurances from China that it has not. It is perfectly possible relations may deteriorate in future.

Which is why developing and testing Agni was a policy of some benefit.

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INDIA PUTS AGNI PROGRAMME BACK ON HOLD (DEC. 5, 1996)

India has decided not to put its Agni Intermediate Range Ballistic Missile (IRBM) into production unless national security is threatened. The decision was contained in an Indian Defence Ministry report delivered in October but only made public by the all-party Parliamentary Defence Committee on December 5.

"Agni is a re-entry technology demonstration project which has been successfully completed and all the objectives have been met," the Defence Ministry Report said. "Agni project did not envisage development of a missile system. ...The decision to develop and produce a missile system based on Agni technology, however, can be taken at an appropriate time consistent with the prevailing threat perception and global or regional security environment."

The announcement appears to mark a significant shift in the policy of India's United Front coalition government and is in stark contradiction to indications earlier this year that the Agni programme would continue.

In August 1996, Dr. A.P.J. Abdul Kalam, scientific adviser to the Indian defence minister, revealed that the Defence Research and Development Organisation (DRDO) had sent a proposal to the Prime Minister, H.D. Deve Gowda, seeking to resume the Agni test flight programme. Later in August, Dr. Kalam stated publicly that the go-ahead from the Indian cabinet was all that stood in the way of a fourth Agni test flight. Such approval appeared likely to be granted following the Prime Minister's August 15 Independence Day Address in which Deve Gowda referred to the Agni by name and stressed that the development project would proceed.

That further tests would take place appeared to be confirmed by the Defence Ministry's 1996-97 annual report released in the third week of August. The report reiterated that India's missile development project would continue

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despite intense pressure from abroad to shelve it and the Defence Ministry went as far as to confirm that it was foreign pressure which caused India to claim that the Agni was a 'technical demonstrator', intended only to achieve its three successful test flights, rather than an IRBM programme.

The December 5 announcement is also at odds with the recommendations of India's all-party parliamentary Defence Committee, which has consistently lobbied for the revival of the Agni programme. In a report issued in March 1996 the Committee unanimously demanded that the government should restart the Agni development programme without delay. Significantly, the Defence Committee was then chaired by Indrajit Gupta, now India's Home Minister (Secretary of the Interior) and a senior member of the United Front government that has been in power since July 1996.

The Defence Committee report emphasized that India had no choice but to continue its missile development project in the face of potential threats from China and Pakistan. Moreover it added that Pakistan's acquisition of Chinese M-11 Tactical Ballistic Missiles (TBMs) meant that India should accelerate the rate of its missile development programmes to ensure that it retained a qualitative edge over Pakistan's imported technology.

The decision to put the Agni back on hold drew fierce criticism from the opposition Hindu nationalist Bharatiya Janata Party (BJP), particularly since it comes only days after the visit to New Delhi of Chinese President Jiang Zemin.

"The Agni missile development programme must go on," said BJP leader Jaswant Singh. "If China supplies M-11 missiles to Pakistan and China has ballistic missiles, it is prudent to take into account the capabilities of nations with whom we have unsettled boundary disputes and a history of arguments,"

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"The signal that this sends to critics of the government following Jiang's visit is that the government is pusillanimous," according to one Western diplomat quoted by the Reuters News Agency.

Earlier this year, an article in the Hindi-language *Navbjhara Times* praised moves to develop the Agni as an operational missile system and derided what it saw as the previous Congress government's neglect of India's national interests:

"The previous Congress government, by putting this project in cold storage in the face of external pressure, had neglected an indigenously developed ballistic missile system which no other country had cared to lend to India. India managed to develop this missile system, despite a vicious international conspiracy and opposition. Seven developed countries, including the United States, started their efforts in 1987 to prevent India from developing this system, hence their impatience to enforce the MTCR (Missile Technology Control Regime) to stop the supplies of all kinds of missile material. Undaunted by this high-level conspiracy, hats off to the brilliant Indian scientists who tailed so hard in their dedicated efforts that they developed five types of missiles for India in less than five years.

On the other hand, Pakistan managed, despite the MTCR enforcement, to get M-11 missiles from China, although the United States still maintains that there is no conclusive proof to confirm Pakistan's having received these missiles from China. When India's security concerns continue to be cast aside so cunningly and so impudently, there remains no alternative for India except to make matching preparations to safeguard its security. The United States not only conveniently evaded the issue of Pakistan's receiving these Chinese missiles, but also overlooked Pakistan's nuclear program with the same patronizing smile."

"Commenting to Reuters on the December 5 announcement, Brahma Chellaney of the Indian Centre for Policy

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Research echoed these sentiments. "There is the widely held perception that India's missile programme has slowed down under U.S. pressure," he said. "Basically the Agni is in hibernation because the government does not have the political will to move ahead."

Agni Could be Deployed within Three Months India Puts Agni Back on Hold Zhuhai Airshow Special Report.

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6

DREAMS FLOAT ON AN IMPATIENT WIND...*

"Dreams float on an impatient wind, A wind that wants to create a new order. An order of strength and thundering of fire."

—Dr. A.P.J. Abdul Kalam

Dr. A.P.J. Abdul Kalam is the undisputed father of India's missile program. He has breathed life into ballistic missiles like the Agni and Prithvi, which put China and Pakistan well under India's missile range. It is too exhausting to track Dr. Abdul Kalam's achievements to date. In the '60s and '70s he was a trail blazer in the space department. In the '80s he transformed the moribund Defence Research and Development Laboratory in Hyderabad into a highly motivated team. By the '90s Kalam emerged as the czar of Indian science and technology and was awarded the Bharat Ratna. His life and mission is a vindication of what a determined person can achieve against extraordinary odds. Even at 68, he is indefatigable and dreams of making India into a technological superpower. More importantly, he is still capable of acting on it.

Born on 15th October 1931 at Rameswaram in Tamil Nadu, Avul Pakir Jainulabdeen Abdul Kalam studied at Schwartz High School in Ramanathapuram. After graduating

* From a poem written by Dr. A.P.J. Abdul Kalam.

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in science from St. Joseph's College in Tiruchi, he did his DMIT in Aeronautical Engineering at the MIT, Madras, during 1954-57.

After completing his third year at MIT, Kalam joined Hindustan Aeronautics United (HAL), Bangalore as a trainee. Here, he worked on piston and turbine engines examining as part of a team. He also received training on radial engine-cum-drum operations. Here he also learnt how to check a crankshaft for wear and tear, and a connecting rod and crankshaft for twist.

In 1958, when he came out of HAL as a graduate of aeronautical engineering, he had his long-standing dream of flying, as two alternative opportunities for employment. One was the job at Directorate of Technical Development and Production (DTD&P) of the Ministry of Defence and another was a career in the Indian Air Force. He applied at both the places, and the interview calls came simultaneously from both.

He went to Delhi for an interview with DTD&P, which did not challenge his knowledge of the subject. Then he went to Dehra Dun for interview with the Air Force Selection Board. Here too, the interview was more on personality test, rather than testing his knowledge. He stood ninth in the batch of 25, and eight officers were selected to be commissioned in the Air Force. Kalam could feel the opportunity to join the Air Force slipping from his hands.

Disappointed at his rejection by the IAF, Kalam visited Rishikesh where he bathed in the Ganga and met Swami Sivananda - "a man who looked like Buddha". He introduced himself to the Swamiji, who did not react to his Muslim identity. He asked Kalam about the reason for his sorrow. Kalam told him about his unsuccessful attempt to join the Indian Air Force and his long-cherished desire to fly. Sivananda guided him saying: "Accept your destiny and go ahead with your life. You are not destined to become an Air

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Force pilot. What you are destined to become is not revealed now but it is predetermined. Forget this failure, as it was essential to lead you to your destined path. Search, instead, for the true purpose of your existence. Become one with yourself, my son! Surrender yourself to the wish of God."

After returning to Delhi, Kalam received an appointment letter from DTD&P. On the next day he joined as Senior Scientific Assistant, with a basic salary of Rs. 250/- per month. Here, he was posted at the Technical Center (Civil Aviation). He lost his resentment of failure, thinking he would be able to make aeroplanes airworthy if not fly aeroplanes. During his first year in the Directorate, he carried out a design assignment on supersonic target aircraft with the help of his officer-in-charge, R. Varadharajan, and won praise from the Director, Dr. Neelakantan. Then he was sent to the Aircraft and Armament Testing Unit (A & ATU) at Kanpur to get shop-floor exposure to aircraft maintenance.

Upon his return to Delhi, he was informed that the design of a DART target had been taken up at the DTD&P and he was included in the design team. After that, he undertook a preliminary design study on Human Centrifuge. He designed and developed a vertical takeoff and landing platform, and Hot Cockpit. Three years later, the Aeronautical Development Establishment (ADE) was formed in Bangalore and he was posted there.

At ADE, Kalam served as a senior scientific assistant, heading a small team that developed a prototype hovercraft. Defence Minister Krishna Menon rode in India's first indigenous hovercraft with Kalam at the controls. But for reasons never explained, the project which would have been a considerable international achievement in those days, was not encouraged. This was probably one of the reasons why he moved out of ADE in 1962 and joined India's space program.

During 1963-82, he served the Indian Space Research Organisation (ISRO) in various capacities. Here Kalam

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initiated Fibre Reinforced Plastics (FRP) activities, then after a stint with the aerodynamics and design group, he joined the satellite launch vehicle team at Thumba, near Trivandram and soon became Project Director for SLV-3. As Project Director, he was responsible for carrying out the design, development, qualification and flight testing of 44 major sub systems. The project managed to put Rohini, a scientific satellite, into orbit in July 1980. He was honoured with a Padma Bhushan in 1981.

In 1982, as Director of DRDO, Kalam was entrusted with the Integrated Guided Missile Development Programme (IGMDP), India's most successful military research task to date. The programme constituted of 5 major projects for meeting the requirements of the defence services and for establishing re-entry technology.

The 5 projects were scheduled to be completed in a time frame of only 10 years and consisted of:

(1) **Nag** - an anti-tank guided missile
(2) **Prithvi** - a surface-to-surface battlefield missile
(3) **Akash** - a swift, medium-range surface-to-air missile
(4) **Trishul** - a quick-reaction surface-to-air missile with a shorter range
(5) **Agni** - an intermediate range ballistic missile, the mightiest of them all.

From his SLV-3 experience, Kalam had learned the advantages of team work and of sharing the tasks with partners in private and public sector industries. In the new management structure of the missile program, Kalam, as the Chairman of the Programme Management Board, delegated almost all executive and financial powers to five carefully selected Project Directors and kept himself free to address the core technology issues. His task was to inspire and monitor over 20 institutions and partners outside - ranging from large public and private sector suppliers to small specialist firms that needed seed money to take up the precision tasks.

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The missiles went up more or less on schedule: Trishul in 1985, Prithvi in 1988, Agni in 1989 and the others in 1990. The development and successful flight test of Prithvi, Trishul, Akash, Nag, and Agni established the indigenous capability towards self reliance in defence preparedness. The successful launching of 'Agni' surface-to-surface missile was a unique achievement which made India a member of an exclusive club of highly developed countries. The Trishul has the unique distinction of being capable of serving all three services.

The establishment of the Research Centre Imarat (RCI), a campus 8 km from DRDL, in 1988 was perhaps the most satisfying achievement for Kalam during the missile years. He received generous funding from the Government to build the futuristic centre, which is totally geared for work in advanced missile technologies. Its state-of-the-art facilities are set in a unique ambience and the level of comfort accorded to the individual worker is matched by few R&D institutions. And Kalam's interest in the environment saw RCI emerge as an oasis in a rocky wasteland. It has a small farm that meets the food requirements of those who stay in the RCI quarters. Kalam was awarded the Padma Vibhushan in 1990.

On 25th November 1997, in appreciation of his contributions to Indian defence and science, Dr. A.PJ. Abdul Kalam was awarded India's highest civilian honour - the "Bharat Ratna". In October 1998, he bagged the prestigious Indira Gandhi award for national integration (for 1997).

After 10 years in DRDL, he went to New Delhi to take over from Arunachalam as Scientific Adviser to the Defence Minister - reluctantly, many in DRDL felt. But the system created by Kalam had taken a firm hold in that decade and the missile programme passed on smoothly into its final phase of production and induction.

In Delhi, Kalam as head of the DRDO had to deliver other prestigious projects, such as the Arjun MBT and the

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Light Combat Aircraft (LCA) projects. "Strength respects strength", this is Kalam's usual response to the question why India needs its own missiles or a battle tank or a combat aircraft. While management practices he adopted for the missile program have inevitably rubbed off on these projects, there are no miracles to be had in strategic development areas. There have been technical problems. Even in the missile program, work on the SAMs and the ATM is slower than anticipated. But Trishul's recent multiple test flights have demonstrated that the system Kalam put in place has inherent strengths.

Kalam is by no means a miracle man. As the head of a vast network of laboratories - whose products include avalanche-controlling structures in Kashmir, water desalination kits for the Thar desert, a world class sonar submarine finder for the latest warship - INS Delhi, and infra-red night vision goggles for the Indian Army - Kalam's attention is necessarily a bit diffused. His self-effacing persona cloaks a formidable catalyst who can make people work.

Kalam is happiest at the drawing board, in discussion with his scientists on how their dreams for the next millennium can be fulfilled. The projects envisaged include an air breathing hyperplane spacecraft that draws oxygen from the atmosphere rather than carry it all the way from the ground, reusable missiles and stealth technology. Kalam has shown that with adequate funding, freedom from procedural holdups and a people-oriented management, India can make products of internationally acceptable technical standards in a demanding arena like defence.

Science, according to Kalam, is a global phenomenon. He feels there are a few areas where India can develop its core competence. These areas are software engineering, computer products and design, agriculture and food, aviation, defence research and space technology and chemical engineering. "This wilt lead to a highly beneficial economic and social progress for the nation.

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Kalam's advice to the youngsters of the nation is to "dream, dream and dream and convert these into thoughts and later into actions." Also to "think big". "We are a nation of a billion people and we must think like a nation of a billion people. Only then can we become big."

On 25th November 1999, Dr. A.P.J. Abdul Kalam was appointed Principal Scientific Adviser to the Government of India and accorded the rank of a Cabinet Minister. Hi; role was to advise on overall scientific development in the country on issues relating to scientific and technical policy in different sectors. Kalam also advised on matters relating to achieving technological self-reliance and foreign collaboration.

On December 8, 2000, the Deputy Chairman of Planning Commission, Shri K.C. Pant conferred the "Life-time Contribution Award in Engineering 2000" on Dr. A.P.J. Abdul Kalam at the annual function of the Indian National Academy of Engineering in New Delhi. Speaking on the occasion, Kalam said that Engineering and technology should be used for the upliftment of the people living below the poverty line.

On November 10, 2001, Dr. A.PJ. Abdul Kalam quit as principal scientific advisor the government. Sources close to Kalam, said he quit because of "lack of executive authority". However Kalam had been for quite some time keen on pursuing academic interests and helping scientists across the country in developing their research capabilities. That's why after quitting he took over the job as ISRO's distinguished professor.

Dr. Kalam has spent the past few years developing the concept of "India Millennium Missions 2020" - a blueprint for transforming India into a developed nation. He calls it "the second vision of the nation" and says he wants to focus on the children of India to ignite in their minds a love for science and the nation's mission: a developed India.

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7

INDIA SHOULD MARKET ITSELF WELL*

DR. ABDUL KALAM ON INTEGRATED DEVELOPMENT PROJECTS, HIS FOCUS ON THE CHILDREN OF INDIA AND MORE....

When Bharat Ratna Dr. Avul Pakir Jainulabdeen Abdul Kalam announced his decision last week to quit as principal scientific advisor to the government, an extraordinary, 43-year-long career ended. Associated with nearly every Indian technological milestone—the first rocket launch vehicle, the first Indian satellite, the first strategic missile and, of course, the Indian nuclear programme—Dr. Kalam has spent the past few years developing the concept of India Millennium Missions (I MM) 2020 - a blueprint for transforming India into a developed nation. Dr. Kalam calls it "the second vision of the nation". Of course, he is not receding into total retirement. He'll work as ISRO's distinguished professor and says he wants to focus on the children of India. Excerpts from an interview with Shantanu Guha Ray:

Can India become a dominant world player?

We need integrated action in five major areas. One, agriculture and food processing: we have to set a target of 360 million tonnes of food and agricultural production. Two,

* Shantanu Guha Ray.

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reliable and quality electricity supply for all. Three, education and health care. Four, information technology, which can also be used to promote education in remote areas. Five, strategic sectors: nuclear, space and defence technology. These five areas are interrelated and culminate in the 30 India 2020 missions. A partnership between R&D, industry and the community as a whole and the government departments will be essential to accomplish the vision.

Don't you feel India's nuclear programme has given the arms race a fillip?

What would you expect us to do? Be sandwiched between two nuclear powers - Pakistan and China - and do tapasya'? For 3,000 years, we have been invaded time and again because of one simple reason: we had virtually no resistance to offer to the invaders. This needs to change, right? If our neighbours have nukes, we must have them too. Otherwise, it weakens our position. We've not created these bombs for decoration.

Why do we see such anti-Indian feelings among our neighbours?

This has happened because India hasn't developed what is known globally as a win-win situation. Look at China and all its antics. It violates trade norms, steals arms secrets from the West and yet, Washington's comfort-level with Beijing is high. This is because of the economics which dominates global politics. India must learn from such examples. We are a developed nation compared to our neighbours. So, we need to work out a situation where the Indian government markets its brand in an aggressive manner across the borders while also giving space to neighbours to have their say in our markets. But has that happened? Interaction between India and its neighbours has touched an abysmal low. It needs to improve. Our neighbours need to understand our strengths and growth areas. They should see where they can contribute. Only then will this distrust subside. People, then, won't talk terrorism, only business.

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You dream of India being on par with the G-8 nations. Isn't that a long shot?

Economic growth comes from the integrated growth of technology, infrastructure, education and, above all, the urge to market our products. Developed countries, to keep their status intact, market their products to countries of different ideologies. For example, the US, in the case of China, has sacrificed the Missile Technology Control Regime and certain aspects of the NPT. In India, we should outgrow our historical-religious focus for economic development. The nation has to market Indian products which have brand value. It should also share its civilisational qualities for world peace. G-8 leaders visit other countries to market their equipment and systems with nicely-packaged political agendas. Recently, I visited Tripura, Assam and Jharkhand. All these states have abundant natural and human resources. There should be integrated development projects in mission-mode, unique for a particular state and funded in an integrated way.

You have said you now want to work with children. Why this new interest?

In my career of 43 years, I've changed my area of work almost every 10 years. Change brings new thoughts, new thoughts lead to innovative actions. From August 2001, I have been visiting many states. I have addressed about 15,000 students, mostly in high schools. I shared their imaginations. I have found that I can communicate well with them. I think I can ignite in their minds a love for science and the nation's mission: a developed India.

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8

Dr. Abdul Kalam Interview*

"Unless India stands up to the world, no one will respect us. In this world, fear has no place. Only strength respects strength".

As a devout Muslim, he prays twice a day. But he is also a Ram bhakt, plays the veena, loves the shri raga, writes poetry in Tamil and, like every proud Indian, swears by Pokhran II and self sufficiency in science and technology. At 67, Dr. A.P.J. Abdul Kalam, is not just another Dr. Strangelove having a torrid affair with the bomb. He is clever, sensitive, amazingly creative and, above all, a soft spoken patriot. India's answer to Western technological arrogance.

What is your vision of India in the next millennium?

I have three. Three visions for India. But before that I speak about them, I have one question to ask of you, Mr. Nandy. Can you tell me why, in 3000 years of our history, people from all over the world have come and invaded us, captured our land, conquered our minds? From Alexander onwards. The Greeks, the Portuguese, the British, the French, the Dutch, all of them came and looted us, took over what was ours. Yet we have not done this to any other nation. We have not invaded anyone. We have not conquered anyone.

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* Excerpts from an interview by Pritish Nandy, Rediff Interviews 31.10.98.

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We have not grabbed their land, their culture, their history and tried to enforce our way of life on them. Why?

Because, I guess, we respected the freedom of others.

Absolutely right. That is why my first vision is that of freedom. I believe that India got its first vision of this in 1857, when we started the war of independence. It is this freedom that we must protect and nurture and build upon. If we are not free, no one will respect us.

My second vision for India is development. For fifty years we have been a developing nation. It is time we saw ourselves as a developed nation. We are among the top five nations of the world in terms of GDP. We have a 10 per cent growth rate in most areas. Our poverty levels are falling. Our achievements are being globally recognised today. Yet we lack the self confidence to see ourselves as a developed nation, self reliant and self assured. Tell me, Sir, is this right? Read the last chapter of my book, *India 2020, A Vision for the Next Millennium* and you will get what I mean.

I have a third vision. That India must stand up to the world. I have written 12 chapters on that. Because I believe that unless India stands up to the world, no one will respect us. In this world, fear has no place. Only strength respects strength. We must be strong not only as a military power but also as an economic power. Both must go hand in hand.

These are visions. What about the reality? What do you see as the most significant achievements of your rather distinguished career culminating in a Bharat Ratna in your lifetime?

My good fortune was to have worked with three great minds. Dr. Vikram Sarabhai of the department of space. Professor Satish Dhawan, who succeeded him. And Dr. Brahm Prakash, father of nuclear material. I was lucky to have worked with all three of them closely and consider this the greatest opportunity of my life.

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I see four milestones in my career. **One:** The twenty years I spent in Indian Space Research Organisation. I was given the opportunity to be the project director for India's First satellite launch vehicle, SLV-3 The one that launched Rohini. These years played a very important role in my life as a scientist.

Two: After my ISRO years, I joined the Defence Research and Development Organisation and got a chance to be part of India's guided missile programme. It was, you could call, my second bliss when Agni met its mission requirements in 1994.

Three: The department of atomic energy and the DRDO had this tremendous partnership in the recent nuclear tests, on May 11 and 13. This was my third bliss. The joy of participating with my team in these nuclear tests and proving to the world that India can make it. That we are no longer a developing nation but one among them. It made me feel very proud as an Indian.

And, finally, **four:** The fact that we have now developed for Agni a re-entry structure, for which we have developed this new material. A very light material called carbon-carbon. One day an orthopaedic surgeon from the Nizam Institute of Medical Sciences (in Hyderabad) visited my laboratory. He lifted the material and found it so light that he took me to his hospital and showed me his patients. There were these little girls and boys with heavy metallic callipers weighing over 3 kg each, dragging their feet around. He said to me: Please remove the pain of my patients. In three weeks, we made these Floor Reaction Orthosis 300 gram callipers and took them to the orthopaedic centre. The children could not believe their eyes! From dragging around a 3 kg load on their legs, they could now move around freely with these 300 gram callipers. They began running around! Their parents had tears in their eyes. That was my fourth bliss.

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Apart from science and technology, what else interests you?

Poetry and music. I have this big library at home and my favourite poets are Milton, Walt Whitman and Rabindranath Tagore. I write poetry too. My book of poems, *Yenudaya Prayana*, has now been translated into English. It is called *My Journey*. You must read it. I will send you a copy.

Who are your favourite poets in Tamil, the language you write in?

Bharatidasana, who died in 1965. And Subramaniya Bharathiar, who died in 1939 at the age of 35, killed by an elephant while giving it a coconut. I also enjoy Carnatic music and play the veena.

What is your favourite raga?

The shri raga: You know my favourite kirtan? It is the one that Swami Thyagaraja, a Ram bhakt like me, recited in the shri raga when he was called by this powerful Tanjore king to sing a poem in his sabha. He sang: "In this gathering whoever are great in front of God, I salute them." He never said: I salute the king. That is strength of conviction. That is courage.

You have asked me so many questions, Mr. Nandy, may I ask you two?

By all means

Tell me, why is the media here so negative? Why are we in India so embarrassed to recognise our own strengths, our achievements? We are such a great nation. We have so many amazing success stories but we refuse to acknowledge them. Why? We are the second largest producer of wheat in the world. We are the second largest producer of rice. We are the first in milk production. We are number one in remote sensing satellites. Look at Dr. Sudarshan. He has transformed the tribal village into a self

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sustaining, self driving unit. There are millions of such achievements but our media is only obsessed with bad news and failures and disasters.

I was in Tel Aviv once and I was reading this Israeli newspaper. It was the day after a lot of attacks and bombardments and deaths had taken place. The Hamas had struck. But the front page of the newspaper had this picture of a Jewish gentleman who in five years had transformed his desert land into an orchard and a granary. It was this inspiring picture that everyone woke up to. The gory details of killings, bombardments, deaths, were inside the newspaper, buried among other news. In India we only read about death, sickness, terrorism, crime. Why are we so negative?

I guess we grew up with the maxim that good news is no news. The right to publish bad news has become synonymous with freedom. That is why our press is so strong, so fiercely independent—if not always encouraging of success stories.

Another question: Why are we, as a nation so obsessed with foreign things? Is it a legacy of our colonial years? We want foreign television sets. We want foreign shirts. We want foreign technology. Why this obsession with everything Imported? Do we not realise that self respect comes with self reliance?

I guess that comes from repression. When you lock in your economy for years and leave it in the hands of local pirates and cheating banias, you are bound to get a backlash. Foreign things have indeed come in but they have also brought down prices, taught us quality, stopped us from cheating consumers with shoddy, overpriced local products. Like in cars, consumer electronics, fabrics, processed foods. Nationalism for too long has been a convenient cover for looting. Let us not forget that. But yes, I agree with you, it is time

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we started giving value to ourselves as a people, as a nation.

I was in Hyderabad giving this lecture, when a 14-year-old girl came up and asked me for my autograph. I asked her what her goal in life was. She replied: I want to live in a developed India. For her, you and I will have to build this developed India. You must proclaim this through your writings, through your speeches in Parliament.

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9

INDIA'S MISSILE DEVELOPMENT WITH FOREIGN ASSISTANCE

India at first concentrated in developing and later manufacturing a Short Range Ballistic Missile (SRBM) named 'Prithvi'. It has a range of 150 miles and is entirely Pakistan - specific. These missiles are now In production and have been issued to the newly raised 33rd Missile Group of the Indian Army. These were originally located at Secunderabad in South India but later on moved to the Pakistan border in May 1997. This was also reported by U.S. officials in Washington on June 4, 1997. The Prithvis are at present deployed at Gurdaspur. They are also being deployed in Indian—occupied Kashmir at Uri, Gulmarg and at Krishna Ghati near Rajaurl. Prithvi silos are under construction at Mahajan in Ganganagar, Barmer, Bikaner, Lathi and Jaisilmer in Rajasthan. India's Prithvi SRBM is of Soviet design, being the Indian version of the Russian scud missile used by Iraq during the Gulf War and by the Soviet Army in Afghanistan. It is consequently a product of Russian collaboration and assistance. It has a range of 250 km (150 miles). A new Air Force version with a range of 250 miles has been tested.

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* Patron Lt. Gen. Sardar F.S. Lodi carries out an extensive analysis of India's missile program and the support in its development made by foreign powers.

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Latest reports indicate that India is improving and updating her Intermediate Range Ballistic Missile (IRBM) 'Agni' which is still under development. It was first successfully test-fired on May 22, 1989, from India's Missile testing range at Chandipur-on-Sea on the Orissa coast in Eastern India. The two earlier attempts having failed, the third attempt which proved successful was able to launch the missile to a distance of 625 miles. Later on two more tests were carried out. It is designed to carry a one-ton payload 2500 kms (1,500 miles), far enough to hit cities in Southern China. Carrying a half-ton atomic bomb, the 'Agni' would be able to fly about 2,200 miles, far enough to hit Beijing, the capital of China.

By test-firing the 'Agni' India became the first country to wrongfully divert the plans, knowledge and material obtained from friendly countries for a civilian space research programme towards building and operating a strategic military missile. The missile's first-stage rocket motor, heat shield and guidance system all came from India's space research programme which had been generously launched and sustained over the years by foreign help from countries who believed in India's word and solemn commitments to employ the technology for peaceful research of outer space.

After the 'Agni' tests the late Rajiv Gandhi, Prime Minister of India at the time had said that Agni (fire) is an R&D (Research and Development) vehicle, not a weapon system. He went on to say Agni is not a nuclear weapons system. What Agni does is to afford us the option of developing the ability to deliver non-nuclear weapons with high precision at long ranges. It is the opinion of defence experts the world over that for a country to invest millions of dollars in developing a medium range surface-to-surface ballistic missile to send conventional high explosives at targets 2500 kms away does not make any military sense. Ballistic missiles of such large dimensions have to be nuclear armed to produce the devastating effect it is designed to. It can only then act as

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a useful deterrent, in India's case it will project her power much beyond her frontiers to the Indian Ocean and its littoral states, also to the Middle East and Central Asia.

Whether 'Agni' eventually carries nuclear or conventional weapons, though it is evident that it will carry the former, the fact remains that it is a missile developed for military purposes from knowledge and components pledged for civilian research of outer space. The missile 'Agni' has also shattered the illusions that sharing advanced technology in the interest of peaceful uses of outer space would benefit humanity. This turned out to be a fallacy. It is now evident that democratic India was prepared to cheat and go back on its solemn assurances given to the Western world when it suited her purpose to do so. She will continue to violate international norms and blackmail and coerce her small neighbours, to be in a position to dominate her region and beyond. It is doubtful if she will succeed, as her friends In the West have started to see India as she actually is - a poor and deceitful nation which is turning into a local bully.

The story of India's 'Agni' missile development shows how difficult it is to separate civilian and military uses of technology and how futile it may be to control the spread of military missile technology. A missile control regime was established by seven Western nations in 1987 which seeks to prevent the spread of missile development, but does not seem to be having much success. As the missile control regime had no provisions for enforcement, so the Indian missile development programme continued apace with considerable foreign help, particularly from the former West Germany after the missile control regime was adopted.

Professor Gary Milhollin writing in 'The Bulletin of the Atomic Scientists' in November 1989 said Agni's foreign ancestry dates from the 1960s. In November 1963, the United States began India's space programme by launching a U.S. sounding rocket from Indian soil (Sounding rockets fly straight up into the atmosphere to conduct scientific

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experiments. They are too small to launch satellites). The United States was followed by others. Between 1963 and 1975, more than 350 U.S., Soviet and British sounding rockets were launched from India's Thumba Range, which the United States helped design. Thumba's first group of Indian engineers had learned rocket launching and range operation in the United States.

Among the first batch of engineers to learn rocket launching and range operation in the United States was 'Agni's chief designer, A.P.Z. Abdul Kalam. In 1963-64, he had spent four months in training in the United States. He visited NASA's Langley Research Centre in Virginia, where the U.S. 'Scout' rocket was conceived, and he also visited the Wallops Island Flight Centre on the Virginia Coast, where the 'Scout' was being flown. The 'Scout' was a low-cost and reliable satellite launcher that NASA had developed for orbiting small payloads.

Immediately after this, in 1965 the Indian government asked NASA how much it would cost and how long it would take to develop an Indian version of the U.S. 'Scout' rocket and whether the United States would help. NASA replied that the 'Scout' was available .... for purchase .... in connection with scientific research, but also added that the transfer of this technology .,.. would be a matter for determination by the Department of State under Munitions Control. NASA however sent to India technical reports on the 'Scout' design, which was unclassified. India's request should have raised some eyebrows and caste some doubts on its innocent and simple procedure as the request had come from Homi Bhabha himself. He was head of the Indian atomic Energy Commission. But no doubts were raised and the request was treated as normal.

A.PJ. Abdul Kalam had by now acquired all the Information he needed. He returned to India and built the SLV-3 (Space Launch Vehicle), India's first satellite launcher. Its design is virtually identical to the U.S. 'Scout' rocket. Both

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Indian and U.S. rockets are 23 meters long. Use four similar solid-fuel stages and Open-loop guidance and lift a 40-kilogram payload into low earth orbit. The SLV's 30-foot first stage was later to be used as the first stage of the 'Agni' missile.

NASA officials maintained that U.S. aid to India in rocketry was limited to the programme in the 1960s. However in 1988, the United States agreed to supply an advanced ring laser gyroscope to help guide a new Indian fighter plane. But there was nothing to prevent India from using it to guide military missiles N which she is reported to have done. The laser gyroscope is a highly accurate device, essentially solid state, making it easy to adept the demands of missile acceleration.

France also launched sounding rockets from India, and in the late 1960s allowed India to begin building Centaur sounding rockets under license from Sud Aviation. But it seems that France's main contribution to the development of India's short and Intermediate range missiles has been in the field of liquid propulsion. Under a license from France's Societe Europeen de Propulsion (SEP), India built its own version of the Viking', high-thrust liquid rocket motor, which had been used on the European Space Agency's Ariane satellite launcher. Indian engineer who had helped in developing the 'Viking' during the mid '70s later began a rocket development programme for India on their return home. It has been named the 'Vikas'.

The training that the Indians received in liquid propulsion paid off handsomely later on. A year before testing the 'Agni', A.PJ. Abdul Kalam of India tested its smaller predecessor, the 'Prithvi' (earth) which uses a liquid - propelled motor to carry a one-ton payload to a distance of 150 miles. It resembles the widely used Russian 'Scud-B' short range surface-to-surface ballistic missile. Indian sources admit that the 'Agni's' second stage is a shortened version of the 'Prithvi'.

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The assistance provided by the United States and France towards the development of Indian missile technology was however quickly dwarfed by German help in the 1970s and 1980s. Germany gave India help in three indispensable missile technologies. These were in the guidance, rocket testing and the use of composite materials. All these were supposed to be for civilian use of the space research programme of India. But all these were equally useful in the development of military missile and that is exactly where India had intended to use this knowledge. Upper space research was only a ploy used by India to hoodwink the West. The question is, was the West willing to be deceived to befriend India?

The German government's aerospace agency DLR (Deutsche Forschungsanstalt fur Luftfahrt und Raumfahrt e. V.) began teaching Indians all about rocket guidance in 1976. The first step was to put a German interferometer on an Indian sounding rocket. An interferometer works by using antennas placed in different locations on the rocket to measure the phase of a radio signal received from the ground. The phase difference among the antennas reveals their relative position on the rocket and thus the rocket's attitude which can be monitored and corrected from the ground. The first launch of an Indian rocket with a German interferometer was in 1978. By 1981 the German project had been expanded to include an on-board DLR microprocessor. In April 1982 India tested its own version of the same interferometer supplied by Germany initially.

The next step was to build a navigation system that did not depend on signals from the ground. It should by itself guide a payload through space by determining its position and speed at any moment. In July 1981 India proposed the autonomous navigation capability to spaceborne sensors thus determining position, velocity, attitude and precision time in a real-time mode. In other words India would supply the rockets and satellites, whereas Germany would provide

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the brains of the guidance system. The key component of which would be an on-board computer, using a micro-processor based on the German Motorola family M68000, and the required software to run it.

It should be noted that an inertial navigation system that can guide satellites can also guide military warheads. The United States had also used NASA's experience in guiding the 'Titan II' transtage, a 'bus' designed, for multiple satellite launchings to develop a 'bus' that would accurately deliver small nuclear warheads.

The German-Indian joint plan was eventually carried out. By January 1982, the two countries had agreed on a series of Joint project for their programmes. At the same time India announced that it was developing a new navigation system for its own rockets which would replace the 'open loop' system used on its first launched SLV-3 with a 'closed loop' system for its Advanced Space Launch Vehicle (ASLV) and its Polar Space Launch Vehicle (PSLV). So while the German - Indian plan called APC - Rex (Autonomous Payload Control Rocket Experiment) was developing, India would also be developing an autonomous navigation for its own rockets. The implication is obvious. India developed the 'Mark-II' on-board processor which was based on the Motorola M68000 microprocessor with 16-bit word length, same as that used in the German programme. The timing of subsequent events showed continued parallel development. The stealing of technology was obvious.

German assistance apparently continued despite the launching of the 'Agni' missile. In May 1989 a DLR official had said that the APC - Rex was to be concluded in 1989. West Germany was one of the seven countries that adopted the Missile Technology Control Regime (MTCR) in 1987. It was an agreement not to export Items useful in making long-range missiles. The agreement also barred the export of technology capable of real-time processing of navigation data, unless specific assurances could be given that the

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technology would not be used for, or transferred to missile programmes. If, as the evidence suggests, the technology from the German - Indian APC-Rex programme has been used in the development of Indian military rockets and missiles, Germany may have violated the MTCR or India gave a wrong specific assurances. The evidence is strong that India's 'Agni' missile owes its brain to German engineering.

The Indian space programme first mentions the 'Agni' in its 1982-83 annual report as a booster rocket for its SLV. Six identical 'Agni' boosters were to lift the missile's first stage. The boosters themselves are adaptations of the first stage of the SLV-3, which is the only large booster motor that India has. It carries nine tons of solid propellant, as does the 'Agni's' first stage. No other Indian booster carries anything close to that amount. India has used the same booster to lift its ASLV. After the 'Agni' missile was launched a number of Indian and foreign sources had reported that the 'Agni's' first stage rocket was identical to the SLV-3 first stage. It is therefore evident that the main rocket for India's military missile programme came from India's space programme which the Western democracies had so generously helped under the false belief that it was a civilian and peaceful research programme. 'Agni's' main rocket owes much to German help. Wind tunnels are essential to the design of any rocket. In 1974-75, DLR tested a model of the first stage of India's SLV-3 In its wind tunnel at Cologne-Portz. DLR also helped India to build rocket testing facilities, furnishing a complete design for the facility and training Indian engineers in high-altitude testing. India had said that it wanted to use this technology to test the liquid- fueled upper stage of its PSLV, but it could also be used to test the 'Agni's' liquid-fueled second stage rocket which must have been done before its launch.

In June 1988, two Egyptian military officers were caught trying to smuggle out carbon fibre composites from the

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United States. Export of the composites was strictly controlled as these strong, lightweight, heat-resistant materials were being used for the nozzles and the nosecones of the United States Mx, Trident and Minuteman nuclear missiles. But the DLR in Germany started giving Indian scientists on-the-job training in composites at Stuttgart and Braunschweing in the mid-1970s. Subjects included glass fibre reinforced composites. The Indians learned composition, manufacturing processes, quality control and error detection.

The essential training provided by Germany helped India to make rocket nozzles and nosecones by themselves. These could be used for either missiles or space launchers. To help the Indians in using the composites, DLR supplied the necessary documents for a precision filament winding machine which India was able to build and commission in 1985-86.

After the 'Agni' test, the Prime Minister of India, the late Rajiv Gandhi said that one of the goals was to test atmospheric re-entry. Other officers were more specific. They said the goal was to test a domestically developed head shield, the know-how for which had come from Germany.

It should be appreciated that no country including India, has ever spent large amounts on long-range rockets simply to explore space. The satellites launched by the Indian SLV-3 were little more than flight monitors, used to transmit data on rocket performance, which was India's true interest. To launch real satellites, India could and did hire better facilities provided by other countries. The Soviets launched India's first two satellites. France's Ariance rocket and the U.S. space shuttle have launched other Indian satellites.

Neither has any country developed long-range ballistic missiles simply to deliver conventional bombs. The large cost of missile development is only justified when it has the ability to inflict a strategic blow and cause or threaten to

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cause unacceptable damage to life and property of the opponent.

India's 'Agni' intermediate range ballistic missile, produced with considerable assistance from unsuspecting Western nations, can therefore only be interpreted as a large step forward towards a long-range and effective nuclear strike force in the making. As India makes progress in the guidance system, the range of 'Agni' will gradually increase to cover the whole of Pakistan, Afghanistan, Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan, most of Kazakhistan and Iran, the Persian Gulf, Bahrain, Qatar, UAE and Oman, portion of Saudi Arabia, most of China and half of Mangolia, touching a bit of Russian territory. In the Far East it will cover the whole of Vietnam, Laos, Cambodia, Thailand, Burma and a bit of Malaysia and Indonesia. It covers a large portion of the Arabian Sea and extends well into the Indian Ocean. Bangladesh and the Bay of Bengal are covered including a portion of the South China Sea. It Is a formidable weapon which can only be used for extending India's power and influence much beyond her frontiers into regions she is planning to coerce and dominate for political and economic reasons.

It is worth remembering that when India exploded an atomic bomb in 1974 and called it a peaceful nuclear explosion, the world was shocked. As India had taken a Canadian reactor and U.S. heavy water which had both been imported under guarantees of peaceful use, but used them openly in defiance of all international norms, to make plutonium for a nuclear test. That blast, that made India a nuclear state (not a threshold one) also destroyed the illusion about a peaceful atom and prompted changes in nuclear export policy by the Western nations.

It is however most surprising that given India's record of deceit and deception in Its international dealings and commitment, she was allowed to take lull advantage of

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civilian imports and technology allowed by the developed Western nations and convert them surreptitiously into a full-fledged nuclear weapons programme.

Having helped India to become a 'nuclear weapons state' the question now is whether the Western nations would continue to help India in her ultimate aim of subjugating the whole of South Asia and the region around it and extending her power and influence to the Middle East in the North and the Indian Ocean in the South. If that happens the possibility of nuclear holocaust in South Asia will be difficult to avoid. The right policy would be to rein in India so that she can take her place in the comity of nations on the basis of sovereign equality of nations, particularly in Asia.

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Dr. Kalam Suggests Alternative Systems for Treating CAD

Dr. A.P.J. Abdul Kalam, former principal scientific advisor to the Government of India, suggested alternative systems like yoga and meditation for the treatment of coronary artery disease (CAD).

"We must do something beyond stinting for treating CAD", he said while speaking at the 53rd annual conference of the Cardiological Society of India (CSI) which was held at Ramoji Film City, here recently.

He said a small project was undertaken in Global Hospital at Mount Abu wherein heart patients, who underwent stinting, could not get the needed relief. "These patients then went through a meditation course and their blocks got melted", Dr. Kalam said. Technology and human heart combination can be brought out to prevent 100 million people from getting CAD by 2020. Dr. Kalam said that R & D funding should ensure indigenisation of health care products and bringing out life-saving drugs at affordable cost.

State Chief Minister N. Chandrababu Naidu, who was the chief guest at the conference, said nearly 40 per cent of the drugs production in the country was in Andhra Pradesh. The aim of the state government was to ensure the setting

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up of a medical college and a dental college in each and every district of the state. He said that Rs. 650 crore was spent on health infrastructure and the budget allocation towards this sector had been Rs. 1472 crore this year.

He pointed out that there had been not even a single case of polio in the state since two years. "We want to eradicate all communicable diseases". Malaria can be controlled and the government is working towards it. The aim of 'Vision 2020' document is at a disease-free society, he said.

Chandrababu Naidu said the objective should be to prevent heart diseases. "We can prevent all diseases, including CAD, by following a disciplined life with regular yoga and exercises", he said. He said he was willing to give land for the setting up of a CSI branch in the city. Today due to the emergence of new technologies and innovations there was no need for one to go abroad for undergoing treatment for any disease. The chief minister called upon the cardiologists to give emphasis on the preventive aspects of heart diseases.

Dr. K. Anji Reddy, chairman of the Dr. Reddy's Group, said his company was the first to enter the drug discovery programme in the country. "We developed a dual activating insulin sensitizer and a drug for coating the stint to check restinosis". The pharma industry is producing drugs that are affordable, he said. Dr. S.S. Chatterjee, honorary general secretary of the CSI, also spoke on the occasion.

The 53rd annual convention of the CSI held at Hyderabad witnessed participation by 3800 delegates from different parts of India and a few from abroad. The earlier convention held at Chennai witnessed around 2900 delegates. A four-day exhibition of drugs and surgical products was also held as part of the convention. Over 60 companies took part in the fair.

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In the echocardiography workshop, there were guest lectures on real time 3-D echocardiography, pulmonary and hepatic venous doppler, foetal echocardiography and hibernating myocardium. There was also a symposia on newer advents in echocardiography and complex congenital cyanotic heart disease. In the Interventional workshop, guest lectures on histological comparisons of brachytherapy and drug eluting stints and sono therapy were held.

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11

In the Service of the Country*

A.P.J. Abdul Kalam, who masterminded India's successful missile programme, has been honoured with the Bharat Ratna, India's highest civilian award.

The call usually came late in the evening. "Kalam here," it always began, followed by the standard question, "What's happening?" One never knew how to respond, for a day's work at the missile-test bed, on the periphery of Hyderabad, meant a hectic 10 hours with everything seeming to go wrong. After preliminary queries came the real business: a key report had to be sent to the Government the next day. "Eat your dinner in peace and come after you have finished," Kalam always hastened to add. He himself had not yet left the laboratory for the day.

This was how Kalam rounded up the "usual suspects", an informal group of scientists and engineers, when some crucial work was at hand. It might be a no-holds-barred session to thrash out some issues of navigation and guidance before a CCPA (Cabinet Committee on Political Affairs) paper emerged, or to solve a problem dogging the elaborate quality assurance testing cycle to which a key missile component was being subjected.

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* Anand Parthasarathy.

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The sessions were always held at a small round table - a table without a head, for protocol-free discussion. Sometimes the sessions would last till the next morning. For discussions during earthly hours, there was a bigger room across the corridor. But here too, failure to reach a decision was not a recognised option.

A.P.J. Abdul Kalam

Kalam attracted fierce loyalties from all those who came into contact with him. He was able to instill a sense of participation at every level, from the shop floor to the high-tech laboratory. His legion of admirers include some children to whose lives he added a special touch. For nine-year-old Swarna, a polio victim from birth, the Composites Production Centre of the Defence Research and Development Laboratory (DRDL) designed an ultra lightweight, prosthetic foot support. A primary school student whose model of the Prithvi missile won the first prize in a contest in Secunderabad was taken to DRDL in Kalam's staff car so that he could see the real Prithvi being assembled.

A.P.J. Abdul Kalam, who was awarded the Bharat Ratna, India's highest civilian honour, on November 25, was born on October 15, 1931 in the temple town of Rameswaram in Tamil Nadu. Kalam went to the Schwartz High School, Ramanathapuram. After graduating in science from St. Joseph's College, Tiruchi, he took a diploma in aeronautical engineering from the Madras Institute of Technology in the mid-1950s. The then Director of MIT, Prof. K.A.V. Pandalai (whom Kalam acknowledged recently as one of his valued teachers, the other being his schoolteacher, Siva Subramani Iyer), gave fascinating details about this phase in Kalam's life in letter to *The Hindu* (March 15, 1994).

Kalam joined the Defence Research Development Organization (DRDO) in 1958 and served as a senior scientific assistant, heading a small team that developed a prototype hovercraft. Defence Minister V.K. Krishna Menon rode in

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India's first indigenous hovercraft with Kalam at the controls. But for reasons never explained, the project, which would have been a considerable international achievement in those days, was not encouraged. This was probably one of the reasons why he moved out of DRDO in 1962 and joined the Indian space programme.

At the Indian Space Research Organization (ISRO), Kalam initiated Fibre Reinforced Plastics (FRP) activities; after a stint with the aerodynamics and design group, he joined the satellite launch vehicle team at Thumba, near Thiruvananthapuram, and soon became Project Director for SLV-3. The SLV-3 project culminated in putting the scientific satellite Rohini into orbit in July 1980. He was honoured with a Padma Bhushan in 1981.

Kalam was something of a curiosity at Thumba. A bachelor, his spartan life-style as a vegetarian and teetotaller who lived in a single room in a lodge in Thiruvananthapuram earned him the nickname Kalam Iyer.

Kalam then moved back into the Defence Research Complex at Kanchanbagh, on the periphery of Hyderabad's Old City, as Director of DRDL. He came to Hyderabad at a time when morale was low at the laboratory as a result of the foreclosure of its ambitious missile project, codenamed 'Devil'. He brought a whiff of ISRO informality to a laboratory that was used to an Army atmosphere. He refused to move into the bungalow allotted to the Director, preferring to stay in one of the eight suites in the Defence Labs Mess. The suite, with a small study and a tiny bedroom, was his home for the next decade.

Agni, an intermediate range ballistic missile, blasts off from the Interim Test Range at Chandipur-on-sea

Kalam was instrumental in the re-emergence of the DRDL. This was made possible, as Kalam and the then Scientific Adviser to the Defence Minister, Dr. V.S. Arunachalam (who brought him back to defence research), have

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always acknowledged, by the crucial role played by R. Venkataraman, who was Defence Minister. Kalam was asked to prepare a blueprint to make India a missile nation. After working with DRDL veterans for over six months, followed by consultations with Arunachalam, Kalam gave a proposal to Venkataraman. It was a staggered scheme under which five missile development programmes were to be taken up one after the other. "Take it back!" said Venkataraman who, though unfamiliar with the technical nitty gritty, had an instinctive feel for larger strategic issues. The Minister suggested that Kalam and Arunachalam recast the plan in such a way as to develop all five missile types under one programme. They did it, as they now admit, by adding "zeroes all over the place."

Kalam's immediate concern was that he would have to tell his colleagues back in Hyderabad that he had committed them to five formidable tasks instead of one. And the time-frame was 10 years.

Out of this audacious initiative was born the guided missile programme, India's most successful military research task to date. Kalam's codenames for the programme's five components were: Prithvi, a surface-to-surface battlefield missile; Nag, an anti-tank missile (ATM); Akash, a swift, medium-range surface-to-air missile (SAM); Trishul, a quick-reaction SAM with a shorter range; and Agni, an intermediate range ballistic missile, the mightiest of them all. Trishul has the unique distinction of being capable of serving all three services.

From his SLV-3 experience, Kalam had learned the advantages of team work and of sharing the tasks with partners in private and public sector industries. In the new management structure of the Missile Programme, Kalam, as the Chairman of the Programme Management Board, delegated almost all executive and financial powers to five

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carefully selected Project Directors and kept himself free to address the core technology issues. His task was to inspire and monitor over 20 institutions and partners outside - ranging from large public and private sector suppliers to small specialist firms that needed seed money to take up the precision tasks.

Kalam's contribution in this scheme has been acknowledged by all who worked with him. He set for himself a gruelling schedule. The first half hour of the day was reserved for what was called the morning meeting, where administrative heads met him to take decisions on routine functions. During this period any employee could walk in and discuss administrative problems, which were usually sorted out the same day. The rest of the day was devoted to hands-on interaction with project teams working on a campus spread over 40 hectares.

The missiles went up more or less on schedule: Trishul in 1985, Prithvi in 1988, Agni in 1989 and the others in 1990. And the Kalam legend had grown. He is well-versed in Tamil and has written poetry. Seventeen of his poems were translated into English by Manidarshi, and published as a book titled *My Journey* in 1994.

The establishment of the Research Centre Imarat (RCI), a campus 8 km from DRDL, in 1988 was perhaps the most satisfying achievement for Kalam during the missile years. He received generous funding from the Government to build the futuristic centre, which is totally geared for work in advanced missile technologies. Its state-of-the-art facilities are set in a unique ambience and the level of comfort accorded to the individual worker is matched by few R&D institutions. And Kalam's interest in the environment saw Imarat emerge as an oasis in a rocky wasteland. It has a small orchard and a farm that meets the food requirements of those who stay in the RCI quarters.

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Scientists greet Abdul Kalam after the successful launch of Agni on May 22, 1989.

Kalam was awarded the Padma Vibhushan in 1990. After 10 years in DRDL, he went to Delhi to take over from Arunachalam as Scientific Adviser to the Defence Minister - reluctantly, many in DRDL felt. But the system created by Kalam had taken a firm hold in that decade and the missile programme passed on smoothly into its final phase of production and induction. In Delhi, Kalam as head of the DRDO had to "deliver" other prestigious projects, such as the Main Battle Tank (MBT) Arjun and the Light Combat Aircraft (LCA) projects. While management practices he adopted for the missile programme have inevitably rubbed off on these projects, there are no miracles to be had in strategic development areas. There have been technical problems. Even within the missile programme, work on the SAMs and the ATM is slower than anticipated. But the recent multiple flights of Trishul demonstrate that the system Kalam put in place has inherent strengths. As Arunachalam put it, "We are now mature: we learn from mistakes and push on ahead."

"Strength respects strength." This is Kalam's usual response to the question why India needs its own missiles or a battle tank or a combat aircraft. But Kalam is a technocrat. Although there are suggestions that he should use his status, which has been enhanced by the award of Bharat Ratna, to push for the active induction of Agni, it would be uncharacteristic of him to press his view too much in geo-political matters.

He is the happiest at the drawing board, in discussion with his scientists on how their dreams for the next millennium can be fulfilled. The projects envisaged include: a terminal guidance system for Agni so that it can be precision-targeted; an "air breathing" hyperplane spacecraft that draws oxygen from the atmosphere rather than carry it all the way from the ground; "reusable" missiles; and stealth technology. Kalam

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has shown that with adequate funding, freedom from procedural holdups and a people-oriented management, India can make products of internationally acceptable technical standards in a demanding arena like defence.

Kalam is no miracle man. As the head of a vast network of laboratories - whose products include avalanche-controlling structures in Kashmir, water desalination kits for the Thar desert; a world class "Sonar" submarine finder for the new warship INS Delhi, and infra-red night vision goggles for the Army - Kalam's attention is necessarily a bit diffused. His self-effacing persona cloaks a formidable catalyst who can make people work.

Anand Parthasarathy is a scientist who worked with A.P.J. Abdul Kalam on the Indian missile programme.

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VISION FOR A PROUD INDIA*

The Dervish of Indian defence is dreamer. Perhaps all frontiersmen are like that. Avul Pakir Jainulabdeen Abdul Kalam has spent all his life near the three water frontiers of India. The newspaper boy of Rameswaram coast on the Indian Ocean spent 20 years dreaming of space frontiers at Thumba space centre on the Arabian Sea. The dreams of the next 20 years were mostly conjured up on the shores of the Bay of Bengal at Chandipur where he test-launched missiles and checked on vehicles that re-enter the atmosphere from space.

The dreamer of these oceanic frontiers is also one of India's frontiersmen in technology. A technology that not only fired Agnis, ignited Prithvis but also can green the barren lands, provide foods to the starving, and profit in world commerce. A First World dream for a third world nation.

It is a dream he shares with Yagnaswami Sundara Rajan another technologist who had his stints in the Indian Space Research Organization, the department of space

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* In an exclusive interview to Sachidananda Murthy and R. Prasannan, the father of India's missile programme, A.P.J. Abdul Kalam Azad talks about why he believes India can become a developed country by 2020.

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contributing significantly to the communication satellite programme, the remote sensing programme and satellite meteorology and mapping systems.

From the sea frontiers and space frontiers, the duo are now dreaming up frontiers of technology-driven prosperity for one billion people. In this they are inspired as much by the grain-rich fields of the green revolution as by the successes of remote-sensing satellites and re-entry vehicles. They see infinite energy that can be released not only from thermonuclear explosions but also from the human resource latent in the ordinary people of India.

Dr. Kalam and Rajan believe that as a nation India should aim to reach at least the fourth position by 2020. And nobody is going to help us reach there, except ourselves. As the globe is shrinking into a village, there is also simultaneous denial of technologies.

But the same sense of purpose that made Pokharans and Prithvis possible can propel whole populations into prosperity. In the book *India 2020, A Vision for the New Millennium*, published by Viking-Penguin India, they identify exactly the bricks of technology that could build the dream. (Incidentally, Dr. Kalam even otherwise seems to have the perfect 20-20 vision. The 65-year-old scientist still does not wear spectacles.) On the eve of the book's release, Dr. Kalam spoke to *The Week* about the contents of the book and also of his other technological passions. Excerpts:

You have a dream. Of a super-India by 2020. But is the political and administrative system conducive to realising this dream? Or do we need a re-look? Perhaps adopt a constitutional engine that drives the nation faster? And an administrative system that can step on its accelerator?

I am not talking of a super-India. What we dream or vision in this book, my co-author Rajan and I are together in it, is that we have to put emphasis on development; on

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how India has to develop with all its resources. This dream has been based on the technology vision 2020 in which nearly 500 experts have contributed. The seeding for the first vision was done in 1857, the first war of independence. Since then it was a collective thought for 90 years. We call it the first vision. In this period emerged the best of leaders in industry, in philosophy, science, technology, politics, in all aspects of life. That vision didn't stop with Independence. We built steel plants, food production suddenly went up, industries took off. We made a lot of progress.

Naturally our requirements are increasing. What next? We have to think. Now we need a second vision. The second vision is that India has to get transformed from a developing nation into a developed nation. This vision, of a developed nation, needs three things. **One**, you should be an economically strong nation. **Secondly**, you should be self-reliant in national security and its technologies. **Third**, you should have a high standing or a high status in the world forums.

But what about the leadership to transform this vision into reality?

We believe, myself and Rajan, that the nation is bigger than individuals. Bigger than the political systems, bigger than the scientists. When minds are triggered or ignited with this vision, the problems that you see and the obstructions would subside.

There is a feeling in the country that our system itself is the impediment to our progress. So do we not need systemic changes?

Everything will take its position if the vision is higher than you.

But this slow-moving administrative system which we have inherited, from the Mughal period which was adopted by the British, can impede the best of visions.

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As I said, the vision is bigger than individuals and organisations. The vision itself will ignite. People will make them do. We have seen that our farmers and scientists can work together and feed the entire country. Whatever problems you are saying have been there. But with all of those problems we have achieved so much. Today we have our own communication satellites. We can launch our own remote sensing satellites. Industrially we have advanced. We are self-sufficient in food. Now this progress has to be oriented to a vision.

But Dr. Kalam, when we were realising the first vision, we had great leaders who were visionaries. Like Mahatma Gandhi. Now do we have that sort of leadership which can carry the vision and the people with them?

I have a different point of view. In the period of the first vision, the leadership emerged with the vision. The vision, a need for freedom, created the best of leaders. There were many of them. Of course Mahatma Gandhi, Jawaharlal Nehru, and even industrialists like J.R.D. Tata. They were all products of the vision.

The world powers reached their status through conflicts.

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Missile Man Rises from Humble Base*

By naming A.P.J. Abdul Kalam its candidate for President, the NDA has fired a missile that the great scientist himself would have been proud of - forceful, effective and more likely to hit home than anything else.

There is little that any one can find to fault the credentials of Avul Pakir Jainulabdeen Abdul Kalam, father of India's missile programme.

He is brilliant and non-controversial, a man who has risen to be the greatest in his field without the use of politics, favours and connections - through sheer hard work, talent and perseverance. In the present context, he is to many, a contemporary hero.

Born at Dhanushkodi, Tamil Nadu on October 15, 1931, A.P.J. Abdul Kalam did a B.Sc. from St. Joseph's College, Tiruchirapalli - the first graduate in his family - and then studied aeronautical engineering at Madras Institute of Technology.

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* K.S. Dakshina Murthy, (Bangalore, June 10, 2002).

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Under Kalam's stewardship, India's missile development programme took rapid strides, culminating in the successful launches of the Trishul, Prithvi, Agni, Nag and Akash missiles. The crowning glory came with the Pokhran II nuclear tests. He was conferred the nation's highest civilian honour, the Bharat Ratna, in 1997. He had been honoured with the Padma Vibhushan in 1990 and the Padma Bhushan in 1981.

Kalam quotes with equal ease from the *Koran* and the *Bhagavad Gita*, plays the veena, writes poetry in Tamil and admires Subrahmanya Bharati. He never married.

Recently, Kalam was refused professorship at Bangalore's Indian Institute of Science for not having a Ph.D. He went to Anna University - where he spun out three unique projects: a brain research centre for mentally challenged kids, a way to format digitally knowledge preserved in palm leaves and a cochlear implant for deaf children.

Kalam's fans cannot be faulted for believing that should he make it to Rashtrapati Bhavan, the country would have repaid his unique services with a job he truly deserves.

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ABDUL KALAM WITH AMRITA INSTITUTE OF COMPUTER TECHNOLOGY*

Amrita Institute of Computer Technology (AICT) at Amritapuri played host today to the Principal Scientific Advisor to the Government of India, Dr. A.P.J. Abdul Kalam. Dr. Abdul Kalam has been honoured with numerous national awards including the Bharat Ratna in 1998, which is the highest civilian award given in India. A great humanitarian, he extended his knowledge of space technology and mechanisms to help disabled children, replacing their 3-kg metal support braces with very light braces made of carbon, weighing just 300 grams. Dr. Abdul Kalam was on campus to speak to the AICT faculty and students.

Seated on stage were Dr. Abdul Kalam, as well as Dr. Balakrishnan of the Indian Institute of Science, and Dr. Madhavan Nair of Vikram Sarabhai Space Centre, and Br. Abhayamrita Chaitanya.

The evening was inaugurated by Br. Abhayamrita, who lit an oil lamp and performed arati to Amma's picture. He was aided by Dr. Abdul Kalam.

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* AICT, November 2, 2001.

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Dr. Abdul Kalam gave the keynote speech, entitled "How to Transform India Into an Integrated Knowledge Society." Dr. Abdul Kalam opened his remarks by sending all best wishes to the members of the audience. He then said that upon entering the AICT building, seeing Amma's picture, he was reminded of a poem he had composed in Tamil years ago:

"Divine beauty enters into me
And beauty enters blossoms happiness
Into my body and soul."

Mindful of the youth of much of his audience, he related a formative story from his own youth. Dr. Abdul Kalam said that on the day after India achieved Her independence, he opened the newspaper and found two photographs, side by side. The first was of India's flag flying high, surrounded by jubilant citizens celebrating their new-found freedom. The second was of Mahatma Gandhi, taken the very day of India's independence. As Father of the Nation, all expected he himself to hoist the flag on high. But rather than celebrating or resting on his laurels, he was found moving among the poor, sick, and injured in Bangladesh, working to alleviate their suffering amid inter-religious strife between Hindus and Muslims. From this image, Dr. Abdul Kalam said, he learned the real meaning of nobility in leadership: in success or failure, one should go on giving.

The body of Dr. Abdul Kalam's speech explored the meaning of a knowledge society vs. an agricultural society, an industrial society, and the currently developing information technology society. He reflected that in tomorrow's world, knowledge will be the primary production resource, rather than capital and labour. The keys to developing a knowledge society, the doctor said, are the ability to create and maintain the knowledge infrastructure, develop knowledge workers and enhance their productivity through creation, growth, and exploitation of new knowledge. Dr. Abdul Kalam stressed that this will lead to comprehensive wealth for the nation and

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to improved quality of life in terms of better health, education, infrastructure and other social indicators.

Dr. Abdul Kalam also placed a special emphasis on the tapping into the unique power and resources of the young, reminding the audience that 70 per cent of India's population is under thirty-five. He also related a story of having recently toured a steel mill and seen thousands of worker; extracting and refining steel. What struck him the most, he said, was the sweat of the workers. Sweat, he said, creates Agni (the Hindu god of fire). This Agni gives power to the nation. He told the youths gathered in the audience to think that they themselves are that Agni-to be willing to work hard for the nation so that India will grow strong.

Dr. Abdul Kalam : *"Thinking is growth. Non-thinking is the destruction of the society... Only the vision of the nation can ignite the young minds. The ignited mind is the most powerful resource on the earth."*

He closed his remarks with a quote from Patanjali's Yoga Sutras : "When you are inspired by some great purpose, some extraordinary project, all your thoughts break their bounds: your mind transcend limitations, your consciousness expands in every direction, and you find yourself in a new, great and wonderful world. Dormant forces, faculties and talents become alive, and you discover yourself to be a greater person by far than you ever dreamed yourself to be."

The stirring lecture from one of India's greatest intellectual luminaries: was followed by a question and answer session.

One questioner asked: "Sir, you must have faced so many difficulties and challenges in becoming a scientist of your order. Where did you find the strength to overcome these obstacles?"

Dr. Abdul Kalam answered by again referencing Mahatma Gandhi as a major inspiration, and concluded by relating a story from his time working on the Indian Space

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Research Organization. The doctor said that in 1979, after ten years of planning a dreaming to launch an Indian satellite from Indian soil, despite the computer's warnings of a serious error. Dr. Abdul Kalam proceeded to launch the satellite, which went into orbit "in the Bay of Bengal." After this devastating disappointment, the scientific team's director (Dr. Abdul Kalam's superior) went before the press and took all the responsibility for the failure on himself.

One year later, when a similar rocket: launched successfully, the team's director asked his team to meet the press and receive credit for the success. From this, the doctor said, he learned that one should always absorb the failures in life, and share the fruits of success with all.

On his way out of the building, Dr. Abdul Kalam was approached by a group of awed students, one of who said "Dr. Kalamji, I want to become a scientist." The doctor answered with a question of his own. "Do you have a piece of paper?" The student eagerly retrieved paper and pen, ready to record the advice of this esteemed scientist. Dr. Abdul Kalam continued, "Write this down. Dream, dream, dream. Think, think, think. And then put that thought into action, action, action. OK?"

Later the same evening he came to Amritapuri Ashram, where he met with Amma. He discussed spiritual matters as well as various national problems with Her, and received her guidance and blessings.

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Dr. A.P.J. Abdul Kalam— Biography*

Dr. A.P.J. Abdul Kalam suddenly resigned his office as the Principal Scientific Advisor to the Government of India on 10 November. I- has said that he will devote himself to research, teaching and interaction with the youth in order to motivate them to work for a strong India. A world-renowned scientist, Dr. Kalam has won many awards including India's highest, Bharat Ratna as well as man' honorary doctorates.

Born in 1931 at Rameshwaram in Tamil Nadu, Dr. Kalam is an eminent aeronautical engineer. He was mainly responsible for propelling India into new frontiers of aerospace and missile technologies before moving to supervising the modernization of defence know-how. India's first indigenous Satellite Launch Vehicle (SLV-3) to launch Rohini Satellite in the near earth orbit and development of advanced technology guided missiles for the country's defence were made possible essentially because of his inspiring leadership. Today India possesses five such missiles namely Prithvi, Trishul, Akash, Nag and Agni which introduced India to the exclusive club of a few countries who possess this advanced technology.

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* Zafarul-Islam Khan.

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To him also goes the credit of developing composite product technology at Vikram Sarabhai Space Centre (VSSC) and at Defence Research and Development Laboratory (DRDL) and establishing production centres for reinforced plastics. He has also established an advanced research centre for missile technology at Hyderabad.

Dr. Kalam was project director, SLV-3, at Indian Space Research Organization (ISRO), chief executive of Integrated Guided Missile Development Programme at DRDL and from 1992 scientific adviser to the Defence Minister and secretary. Department of Defence Research and Development, director general, Defence Research and Development Organization (DRDO).

Dr. Kalam is also the founder chairman of Society for Bio-medical Technology (SBMT) which promotes cost-effective medical system as spin-off from Defence Technology. He is chairman of Technology Information, Forecasting and Assessment Council (TIFAC) that has brought out the national technological plan 'Technology Vision: 2020.'

Western technology cartels, such as the Missile Technology Control Regime (MTCR), often used for political arm-twisting, spurred Dr. Kalam and his team at the DRDO to work out a durable way out of external dependence. He believes that in the highly competitive world today, a nation is Judged and respected for its indigenous technological strengths. As regards the Vision 2020 programme he said that it envisages the growth of the country in ali direction - from farming to missile technology, field of life sciences to industry and the goal set before the scientific community is to achieve 70 percent self-reliance in indigenous systems from the present 30 percent by 2005CE.

Besides being an outstanding scientist, Dr. Kalam possesses exemplary qualities of leadership. His capacity to inspire team work has been well-acknowledged and has

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contributed greatly to a highly successful career. He is an individual who can bridge the spectrum from frontline technology development to production.

Dr. Kalam is often referred to as 'father of Indian rockets.' Incidentally, it was an Indian Muslim, Tipu Sultan, the tiger of Mysore, who invented the first rockets in the world during his wars against the British colonialists. Some of those rockets are still preserve in a museum in Greenwich.

As a child, Avul Pakir Jainulabdeen Abdul Kalam remembers being fascinated by the flight of seagulls. He grew up on the island of Rameshwaram in south India, where his father was a boat builder. Kalam's interest in flight led to a degree in aeronautical engineering, and eventually to his supervising the development of India's guided missiles. Along the way, he found time to write Tamil poetry and learned to play the veena, an instrument similar to the sitar. Today Kalam, 67, who is India's best known scientist, heads the mammoth Department of Defense Research and Development. He played a key role in the nuclear tests at Pokhran in the Rajasthan desert on May II and 13. "I remember the earth shaking under our feet," he recalls of that fateful experience.

Perhaps all frontiersmen are like that. Avul Pakir Jainulabdeen Abdul Kalam has spent all his life near the three water frontiers of India. The newspaper boy of Rameswaram coast on the Indian Ocean spent 20 years dreaming of space frontiers at Thumba space centre on the Arabian Sea. The dreams of the next 20 years were mostly conjured up on the shores of the Bay of Bengal at Chandipur where he test-launched missiles and checked on vehicles that re-enter the atmosphere from space.

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world commerce. A First World dream for a third world nation.

With Yagnaswami Sundara Rajan, another technologist who had his stints in the Indian Space Research Organization, the department of space contributing significantly to the communication satellite programme, the remote sensing programme and satellite meteorology and mapping systems.

From then, the duo are now dreaming up frontiers of technology-driven prosperity for one billion people. In this they are inspired as much by the grain-rich fields of the green revolution as by the successes of remote-sensing satellites and re-entry vehicles. They see infinite energy that can be released not only from thermonuclear explosions but also from the human resource latent in the ordinary people of India.

Dr. Kalam and Rajan believe that as a nation India should aim to reach at least the fourth position by 2020. And nobody is going to help us reach there, except ourselves. As the globe is shrinking into a village, there is also simultaneous denial of technologies.

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Things you didn't know about Kalam

- That Dr. Abdul Kalam is a bachelor and a teetotaler?
- That he recites the *Holy Quran* and the *Bhagvad Gita* daily and is equally at home with both Holy Scriptures?
- That Dr. Abdul Kalam has gone abroad for studies only once in 1963-64 to the National Aeronautics and Space Administration (NASA) in the United States?

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- That as a young boy, he sold newspapers to enhance his family's income?
- That he is so modest about his achievements that at every felicitation ceremony he gives full credit for India's success to his colleagues?
- **Oct 15, 1931 :** Born at Dhanushkodi in Rameswaram district, Tamil Nadu. His father had to rent boats to pay his school fees. He studied at the Schwartz High School in Ramanathapuram.
- **1954-58 :** After graduating in science from St. Joseph's College in Tiruchi, he enrolled for Aeronautical Engineering at the Madras Institute of Technology in 1954.
- **1958 :** Kalam joined the Defence Research & Development Organization (DRDO) and served as a senior scientific assistant, heading a small team that developed a prototype hovercraft. But the project, never took off.
- **1962 :** Following the lukewarm response to his hovercraft program, Kalam moved out of DRDO and joined Indian Space Research Organization (ISRO)
- **1963-82 :** Kalam joined the satellite launch vehicle team at Thumba, near Trivandram and soon became Project Director for SLV-3.
- **1980 :** Rohini put into orbit in the month of July
- **1981 :** Kalam honoured with the Padma Bhushan
- **1982 :** Kalam returns to DRDO as its Director. Takes charge of India's integrated guided missile development program. The program envisaged the launch of five major missiles.
- **1992 :** Kalam takes over as the Scientific Advisor to Union Defence Minister.
- **1997 :** Kalam honoured with "Bharat Ratna", India's highest civilian award.

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- **May 11, 1998 :** Adorning a Gorkha hat in the Rajasthan deserts, he orchestrated India's underground nuclear tests. The scientist from a small hamlet in Tamil Nadu who had dreamt of India as a nuclear power many years ago had finally achieved it !
- **June 10, 2002:** NDA picks Kalam for President.
- **June 13, 2002:** Congress backs Kalam for President's Post.
- **June 18, 2002 :** Kalam files nomination papers for President's post.

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16

SALAAM KALAM

PERSONALITY

- Despite his great achievements
- India's 'Father of Missile Technology'
- A.P.J. Abdul Kalam is still the man next door

The narrow, slushy lane led through a timber yard, past houses with peeling plaster and crumbling walls. The smell of fish was all-pervading. We soon reached our destination. House No. 2 on Mosque Street in Rameswaram. An old man responded to our tentative knocks. Was he A.P.J. Abdul Kalam's brother? we asked. A barely perceptible nod. Could we talk to him about his famous brother?

A.P.J. Mohd. Muthumeeran Marakayar glared at us. "Why didn't you call and come?" he demanded. Desperately, we spun tales. But the old man wouldn't buy. The premium for talking about his famous brother was a warning over the phone so that he could be 'ready' for us. Muthumeeran Marakayar, or 'chinna' Marakayar as he is known in Rameswaram, is a very dominant personality. Decades ago, one stern look from him could arrest the naughtiness of his siblings. Today, one of them, Aavul Pakkiri Jainulabiddin Abdul Kalam, 66, is making history.

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* E. Vijayalakshmi in Rameswaram.

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"Of course, I am happy about the Bharat Ratna my 'thambi' was awarded. Four of us attended the ceremony in Delhi last March. Kalam took care of us there. We didn't have to spend a paisa," he said, opening the conversation. Apparently, when Kalam was notified about the Bharat Ratna he first informed his brother. "He then asked me to organise a 'biriyani' party for friends and relatives for which he sent us money. We held prayers and had a big party in this house," said Muthumeeran. "Kalam was the first graduate in the family. The rest of us didn't even finish school," said Muthumeeran. He remembers that Kalam "was always experimenting with something or the other". Kalam began at the 'Samiyar' school in Rameswaram, and moved to the Schwartz School in Ramnathapuram town. Graduation was from St. Joseph College in Tiruchi.

"We used to hear of his good academic performance at Tiruchi. Even then we used to say that he would go very far," recalled Venkatasubramania Shastrigal, 71, a good friend of Kalam at Rameswaram. Kalam then went on to do aeronautical engineering at the Madras Institute of Technology.

Kalam's father, Jainulabiddin Marakayar was a panchayat board president. He also owned a few boats which ferried pilgrims between Rameswaram and Dhanushkody. But after a cyclone ravaged Dhanushkody in 1964, the operations were limited to ferrying passengers between Rameswaram and ships anchored off the coast.

Kalam's father had an excellent relationship with the main Ramnathasamy temple in the town. According to Muthumeeran, in return for supply of small boats every year, his father was accorded certain honours by the temple authorities during temple festivals. He is bitter that this tradition is no longer honoured.

Abdul Kalam was perhaps marked out to be different right from the beginning. Since he was the youngest in the

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family, he got his fair share of pampering from the elders. But neighbours remember him as a reserved boy who was very interested in reading books. "I used to have a library and Kalam was always there, asking for books," said S.T.R. Manickam who has known Kalam since he was a boy. "He used to read everything he could catch hold of. It was amazing."

In a way, this library was the foundation on which Kalam built his career. A fact he acknowledged in a new year card he sent to Manickam last year. In chaste Tamil Kalam had written, 'Your library was, in my youth, a source of great inspiration to me. "Manickam who treasures this card, proudly displayed it to *The Week*.

Kalam is quite attached to home town. The last time he visited the place was three years ago, for a relative's wedding. "He came surrounded by security. We just peeked at him from outside," commented a neighbour. Added 'chinna' Marakayar, "All of a sudden there were security guards all over."

But the doors of the house were open to all his friends and acquaintances. "I went to meet him and we sat and spoke about the good old days. He has not forgotten us in spite of becoming such a big man," said Venkatasubramania Shastrigal. "As a young boy he sometimes used to come and deliver the papers at the behest of his brother who was a newspaper agent. Today, he is making news."

There is no question of not approving of the nuclear tests. After all, ask residents, isn't one of its heroes their own brother? And a very forthright one at that. Confirmation of this is the term 'kalamitous' that his colleagues invented to describe his frustration whenever the tests were delayed. Kalam regularly keeps in touch with his family through phone and he also helps them financially when the need arises. But one thing is taboo: he won't use his influence to get a family member or relative a job.

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Said 'chinna" Marakayar with just a tinge of annoyance in his tone, "He will never recommend a relative or friend. Well, we also don't ask him now." The youngsters in the family though are quite impressed by their famous 'uncle*. Said Kalam's grandnephew Sheikh Dawood, "He always asks us to study well. We are all inspired by him. "

Kalam, according to his family, is a strict vegetarian. Adept at playing the 'rudra veena', he is a fan of the Tamil poet Subramania Bharathi. Kalam never did marry. He once told a friend, half-jocularly, that if he had married, he would never have achieved even half of what he has managed to. "When he was posted in Thiruvananthapuram, we almost fixed an alliance for him. But my wife and daughter fell ill and we got distracted by that. After that he left for Hyderabad," recalled Kalam's brother.

The man, ascetic in looks and behaviour, is quite religious. According to his brother, Kalam prays twice a day, in the morning and at night. "He is so busy throughout the day. Where can he get time to make the five prayers every day?"

Rameswaram residents want to hold a felicitation ceremony for Kalam. Manickam has written to Kalam about it, but enhanced security considerations might prevent Kalam from visiting his home town soon. "We are crossing our fingers and hoping he would be able to make it here soon," said Manickam.

So far no tangible benefits have accrued to the town because of Kalam. But the residents have no complaints. As front-page news on Pokhran continue to mention Kalam, Rameswaram residents swell with pride. "Abdul Kalam," as the visibly proud waiter at the TTDC hotel said, "is a son of the soil. That is enough for us."

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17

India's Nuclear Bomb*

INTRODUCTION

The impish, round-faced physicist wiped sweat from his brow in the 107-degree heat. Sixty-one, he was too old to be wearing army fatigues. They provided less heat relief than light white cotton. Yet, there he was, a South Indian Brahmin in the Rajasthani desert, the chairman of the Indian Atomic Energy Commission pretending to be an Army Major general. Dr. Rajagopala Chidambaram was about to make his mark on Indian, and perhaps world history. At his side sat Dr. A.P.J. Abdul Kalam, a short sixty-six-year-old aeronautical engineer with long white hair, a Muslim with a self-professed fondness for Hindu culture who now bore the alias Major General Prithviraj. The code name betrayed the ironic wits of these men and their colleagues. Prithviraj was New Delhi's twelfth-century Hindu ruler, and Prithvi was the name of India's first nuclear-capable ballistic missile, which Kalam had helped bring into the world.

Chidambaram and Kalam were not playing soldier; they were sitting, disguised, in a small control room listening to a fateful countdown: five, four, three, two, one . . . They were leaders of the strategic weapons establishment, an enclave of scientists and engineers in India's defence research and

* George Perkovich.

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atomic energy institutions who for five decades had been pushing India to join the exclusive club of nuclear weapon states. Now, on May 11, 1998, they were on the verge of crossing the threshold unambiguously.

Almost exactly twenty-four years earlier, in May 1974, Chidambaram and a couple of dozen fellow scientists and engineers had encamped at this same desert site 150 kilometers from the Pakistani border, near the village of Pokhran. During the nights as they lay on cots in the hot air they looked to the skies and searched for the light of a passing American satellite, wondering whether they would be detected as they prepared to conduct India's first nuclear explosion. They went unnoticed, and on May 18, 1974, the team detonated what India's leader, Indira Gandhi, insisted was a "peaceful nuclear explosive." But the ambivalence of this peaceful nomenclature meant trouble for the strategic weaponeers. Indira Gandhi and successive prime ministers resisted the scientists' and engineers' desires to conduct additional tests and develop an overt nuclear weapon program. Moral doubt, political turmoil, and the censure of the United States and the international community put the brakes on their plans. For twenty-four years the scientists and engineers pushed against the Indian government's self-restraint.

Now, in the hot May of 1998, veterans like Chidambaram and newer additions to the enclave like Kalam and K. Santhanam were on the verge of manifesting decades of theoretical and experimental work. The team in Pokhran had learned lessons from previous frustrated testing attempts, most recently in 1995, when U.S. satellites had spotted them. Washington then exerted considerable pressure on India's prime minister to desist, which he did. This time, more than two years later, the scientists, engineers, and labourers employed elaborate camouflage—including the fatigues on their backs to make them look like army men, not bomb builders and testers. They worked in the open

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desert only when they knew spy satellites were not overhead. And this time they had the firm blessing of a new government led by the Bharatiya Janata Party (BJP), which unlike all previous ruling parties rejected India's normative aversion to nuclear weapons. The BJP wanted the bomb, and the strategic enclave wanted to give it to them. Together they were going to show themselves and the world that they had mastered the ultimate in human power over nature, the hydrogen bomb.

At 3:45 p.m. local time, the countdown ended and the desert rumbled. Three nuclear devices exploded simultaneously. The scientists, engineers, and army labourers cheered. It was possible that India, and perhaps the world, would never be the same. Whether for good or ill remained to be learned.

Prime Minister Atal Behari Vajpayee, a soft-spoken seventy-one-year-old bachelor who had built his Hindu revivalist party into a formidable political presence, declared that India was now a nuclear weapon power. Its exact capabilities—quantitatively and qualitatively—remained uncertain to the Indian public and the outside world. Yet India certainly possessed now-proven designs for compact fission weapons of destructive power akin to the bombs that destroyed Hiroshima and Nagasaki, and probably for more powerful boosted-fission weapons. With subsequent refinement, thermonuclear weapons, or H-bombs, were also now within India's grasp. In 1998, analysts believed India possessed roughly twenty-five ready-to-assemble fission weapons, with enough weapon- grade plutonium for perhaps an additional twenty-five, depending on assumptions regarding warhead designs. India also operated a pilot plant for extracting tritium from heavy water, a key isotope for boosted-fission and thermonuclear weapons. Several means existed for delivering these weapons. Dozens of imported Jaguar, MiG-27, and Mirage-2000 fighter-bomber aircraft were capable of performing this role, and some unknown

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number of these aircraft had been modified to conduct nuclear missions. India also possessed a few dozen Prithvi ballistic missiles with ranges from 150 to 250 kilometers. These conceivably could carry nuclear weapons to targets in Pakistan. The longer-range Agni missile was still under development. A first-generation design of the Agni system had been tested three times, to ranges of approximately 1,000 kilometers, and in 1998 the Defence Research and Development Organization was preparing to flight-test an improved version intended to range up to 2,500 kilometers. The Agni was now slated to be the nuclear weapon delivery system against China. Indian strategic analysts suggested that the state should advance its ballistic missile capabilities to the point where targets 5,000 kilometers away could be reached.

However, India still lacked a national security and defence strategy to determine the role of nuclear weapons. Since 1974, India had pursued a "nuclear option" strategy. This entailed the capability to assemble nuclear weapons quickly- within hours or a few days- paired with the expressed intention not to do so until a grave threat to its security arose. The nuclear option reflected India's normative aversion to nuclear weapons, its emphasis on global nuclear disarmament, and political leaders' preferences to concentrate resources and energy on economic development. Indian leaders and some strategic analysts believed that nuclear deterrence could be effected without prior deployment of nuclear weapons mated to their delivery systems. They categorically rejected the doctrines and arms racing of the cold war superpowers. They tended to view preparations for fighting a nuclear war as excessively dangerous, costly, and immoral. In South Asia, especially, the proximity of India and Pakistan to each other made the risks of radiation fallout great even if an aggressor could execute an early strike. Instead of building redundant nuclear arsenals on hair-trigger alert in the name of certain mutual destruction, the few Indians who attended to these issues believed that it was adequate to make an

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adversary uncertain that nuclear threats or attacks on India would not be met with nuclear reprisals. Nuclear weapons pose such horrifying threats, they argued, that this approach was adequate to deter a rational adversary. No greater capability would deter an irrational adversary.

Nonetheless, in the 1990s, Indian strategists and a few politicians began seriously to question the adequacy of the "option" strategy and non-weaponized deterrence. The Nuclear Non-Proliferation Treaty was extended indefinitely in 1995, perpetuating the possession of nuclear weapons by the United States, Russia, Britain, France, and China for the indefinite future while denying the rest of the world these weapons. This outraged Indian specialists and the attentive public, prompting rethinking of India's own nuclear policy. Some Indian military and non-governmental strategists had long ago decided that the country should deploy nuclear weapons. For them, the developments in the mid-1990s offered another political opportunity to make their case. True believers in nuclear disarmament had been driven from effective power by 1998 or had been disillusioned by the failure of the major powers to pursue nuclear disarmament even after the cold war's end. Cynics who had used complaints about inadequate progress in nuclear disarmament to cover India's own ongoing nuclear weapons and ballistic missile programs wanted to lift the veil. The strategic enclave had run out of patience. After twenty-four years of self-restraint, the May 1998 nuclear tests reflected all of these changes.

Still, no new doctrine guided the tests, only vague imperatives to show national will and status. Nor did a consensus emerge after the tests on what India's nuclear doctrine should be. Several developments seemed likely. India might or might not decide to deploy nuclear weapons on aircraft or ballistic missiles in an overt, readily usable posture. Deployment or not, the state would develop formal command and control arrangements to demonstrate clearly

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that India could and would respond to nuclear threats against it. India would also maintain its traditional insistence that it would not use nuclear weapons first. That is, India would launch nuclear weapons only in retaliation to a nuclear attack. India also would eschew nuclear-war-fighting doctrines in hopes of limiting the number of nuclear weapons it would possess to a minimum necessary to cause politically unacceptable damage to an aggressor. However, it remained unclear whether partisan political pressures within India and Pakistan would thrust the two states into an arms race despite their professed desires to minimize their arsenals. Even settling on and implementing these basic doctrinal principles would require overcoming inertia, inter-service rivalries, political fractiousness, and preoccupation with more pressing domestic issues.

Objectives, Themes, and Summary Findings

India's Nuclear Bomb is first and foremost an analytic history of how India's nuclear explosive program evolved from its inception in 1947 through the early aftermath of the May 1998 nuclear tests. Each chapter uncovers actions and decision-making processes generally unreported in the existing literature. The history is divided into three phases. Chapters I through 7 chronicle the period from 1947 through 1974, during which Indian scientists developed the technical means to produce nuclear weapons within a polity that had moral doubts and competing priorities. This first phase culminated in 1974 when the scientists finally persuaded the government to authorize the first nuclear explosive test. Chapters 8 through 12 chronicle the second phase, from 1975 through 1995, in which India surprised itself, the United States, and much of the world by not conducting follow-up nuclear tests and not building a nuclear arsenal. Indian scientists and engineers continued, often secretly, to develop nuclear weapon and ballistic missile capabilities during this period, but moral and political doubts, domestic turmoil, and competing national and international priorities caused India's leadership to refrain from evolving nuclear postures and

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policies like those of the United States, Russia, the United Kingdom, France, China, and Israel. India's policy of self-restraint began to give way in 1995 due to developments in the international nonproliferation regime and political changes within India. This marked the transition to the 1998 nuclear tests and the third phase of India's nuclear history, as recorded in chapters 13 through 15.

By shedding light on the past, the book seeks also to illuminate how India and other states may move in the future. Leading theories and expectations regarding nuclear "behavior" derive primarily from the U.S. and Soviet experiences as well as from modem European history. Yet, in the future, other states, particularly in Asia, seem likely to play equally important roles in international security. The Indian case can yield useful insights into the dynamics of this larger set of states in the post-cold war world. Thus, history, international relations theory, and nonproliferation policy meet or perhaps collide in this volume, particularly in the concluding chapter, which considers the meaning of India's nuclear policy for global nuclear theory and policy.

Three major questions are answered in this chapter.

(1) Why did India develop its nuclear weapon capability when it did and the way it did?

Conventional wisdom holds that India has sought and acquired nuclear weapon capability to redress threats to its security. China and Pakistan, separately or together, pose the threat. The U.S. Defense Department's 1996 publication Proliferation: Threat and Response reflected this typical assessment:

The bitter rivalry between India and Pakistan which dates to the partitioning of the subcontinent in 1947, remains the impetus behind the proliferation of NBC [nuclear, biological, and chemical] weapons and missiles in the region. The security dynamics of the region are complicated further by India's perception of China as a threat. . . . India's pursuit

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of nuclear weapons was first spurred by a 1962 border clash with China and by Beijing's 1964 nuclear test.

The official U.S. understanding of why India (and Pakistan) possesses nuclear weapon capability echoes the dominant scholarly conception of nuclear proliferation. Structural Realism, arguably the most influential theory in the international relations field, predicts or explains that states in an anarchic international environment will seek to maximize their power for self-preservation or, more neatly, their security. If an adversary or adversaries possess nuclear weapons, or appear likely to in the future, a state would be expected to seek nuclear capability to balance that threat in the absence of alternative means. Applying this theoretical model to India leads to the common conclusion that the "central cause of Indian nuclear proliferation is a realist one, it was to match the capabilities of China. . . . Only India's nuclear capabilities could elevate India to a position where it could not be subject to Chinese nuclear coercion."

(Structural Realism is an outgrowth of the Realist school of thought in international relations. Each is based on assumptions and axioms about how states behave in the international system, along the lines summarized above. When referring to these schools of thought and their formal assumptions, this text capitalizes "Realism" and "Realist." This is to distinguish Realism as a conceptual and policy-making paradigm from the use of the term "realism" to connote an actor's awareness that the international milieu is a frequently rough place where leaders and states have mixed motives ranging from idealism to power lust, and where threats of violence often appear, requiring leaders to prepare for the worst. One may realistically comprehend international realities without subscribing to Realism or Structural Realism as schools of thought or "manuals" for policy-making.)

Assuming that states such as India make decisions according to Realist models and are driven primarily by

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national security imperatives. Western theorists and policy-makers expect that India should build and deploy a nuclear arsenal of sufficient quantity and operational quality to ensure that it could withstand an adversary's first strike and retaliate with enough nuclear force to end a war on India's terms. Indeed, according to these theories India should have built, deployed, and operationally fine-tuned such a survivable second-strike arsenal long ago.

The prevalent explanation of why and how India developed nuclear weapon capability, as just summarized, is based on a number of erroneous "facts" and assumptions. Moreover, the story told through this conventional explanation is woefully incomplete. Whereas most theorists and policy-makers dealing with nuclear proliferation posit that security concerns singularly determine state nuclear policies, this study shows that India's development of nuclear weapon capability only vaguely responded to an ill-defined security threat. Furthermore, India's forbearance in proceeding further to deploy a nuclear arsenal—from 1964 to 1998, and perhaps beyond—also cannot be explained primarily by reference to external security considerations or the universal applicability of Western models of nuclear deterrence.

Domestic factors, including moral and political norms, have been more significant in determining India's nuclear policy, as this book details. Often, tensions between domestic interests have made this policy appear ambivalent and ambiguous. India has been torn between a moral antagonism toward the production of weapons of mass destruction, on one hand, and on the other hand, an ambition to be regarded as a major power in a world where the recognized great powers rely on nuclear weapons for security and prestige. India's domestic imperative to foster socio-economic development has clashed with an interest in building up military strength. India's policy-making processes and institutions also have affected its nuclear history: Indian political leaders and the leading scientists have consciously

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excluded the military from nuclear decision making, again for internal reasons. Each of these material and ideological factors has been in some way affected by India's colonial past and post-colonial identity. Acquiring nuclear weapons proves that Indian scientists are as talented as those of the world's dominant powers; doing so in the face of the U.S.—led nonproliferation regime, which Indians consider a system of "nuclear apartheid," reasserts India's repudiation of colonialism. Yet, if India followed fully the nuclear paths of the United States, the United Kingdom, or China, it would violate its own quest to be morally superior to and more humane than these states. These and other related factors largely explain the twists and turns of India's nuclear history from 1947 through 1998.

(2) What are the factors that keep India from stopping or reversing its nuclear weapon program?

Proliferation entails state decisions to acquire nuclear weapons. Non-proliferation involves decisions to verifiably abjure and, in some cases, "reverse" acquisition of nuclear weapons. The latter practice of eliminating capabilities actually amounts to unproliferation, or disarmament. Proliferation and unproliferation are distinct phenomena, even if they are often conceptualized as flip sides of the same coin. (As the cold war major powers shaped the lexicon and framework of global nuclear policy and the non-proliferation regime, they distinguished between their own accretions of nuclear weapons and the acquisition of nuclear weapons by other states. They called the latter "proliferation." Similarly, they distinguished arms control and disarmament from "nonproliferation," overlooking the essential similarity between disarmament and the hoped-for nonproliferation process of rolling back nascent nuclear weapon capabilities. This book maintains the traditional categorical and lexicographic distinction for convenience's sake and refers to the objective of reversing proliferation as "unproliferation" instead of disarmament, although the same processes are required to achieve either objective.)

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Almost all of the existing literature assumes that to reverse proliferation it is necessary only to know and remove the causes that drove a state to acquire nuclear capability in the first place. Assuming that security concerns singularly determine state interests in acquiring nuclear weapons, the prevalent literature posits that if insecurities are removed, unproliferation should occur. However, India's nuclear program challenges these assumptions. India's nuclear weapon capabilities have assumed deeply rooted domestic importance independent of security considerations. The process of building nuclear weapon capabilities has created interests, bureaucratic actors, beliefs, perspectives, and expectations within the state and society. That is, proliferation qualitatively changes the state that engages in it, altering the array of interests that must be addressed before unproliferation can occur. The Indian case suggests that these changes and their effects are particularly important in democracies.

This is not to say that security considerations have been unimportant. India probably will not relinquish its nuclear weapon capabilities as long as Pakistan possesses similar capabilities and as long as the Sino-Indian border dispute remains unresolved and those two nations' strategic relationship unsettled.

Yet, as the narrative chapters of this volume detail and the conclusion analyzes, specific domestic factors greatly complicate the prospect of India's formally constraining or eliminating its nuclear weapon and ballistic missile capabilities. These factors include the perception that nuclear capabilities symbolize India's achievement of scientific-technical prowess and national sovereignty and establish India's membership in the aristocracy of nuclear states who set the standards of international rank. India also perceives the U.S.- led nonproliferation regime as a racist, colonial project to deny India the fruits of its own labour and the tools of its own security. These perceptions have become stronger

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as India's nuclear capabilities have grown, and they have become politically potent thanks to the exertions of the strategic enclave. As the conclusion of this volume suggests, democracy in India—and perhaps in other states—makes unproliferation even less likely. This has major implications in light of the fact that seven of the eight declared and undeclared nuclear weapon states today are democracies and the hope of stopping the further spread of nuclear weapons over time may depend on these states' willingness to pursue nuclear disarmament, or unproliferation.

(3) What effects has the United States had on India's nuclear intentions and capabilities?

The extant literature concludes that the United States generally has failed to develop coherent and effective policies toward South Asia. Lacking major intrinsic interest in South Asia, the United States viewed India and Pakistan largely as pawns in the cold war. This instrumental approach exacerbated the inevitable difficulties posed by deep cultural differences and post-colonial antagonisms between the United States and the South Asian nations. Worse still, the intractability of Indo-Pak enmity and rivalry has made it extremely difficult for the United States to pursue solid relations with both states at the same time. However, even allowing for this inauspicious backdrop, in the specific realm of nuclear non-proliferation policy, Washington's interactions with India have been particularly ineffective in reducing India's motivations to acquire nuclear weapon capability. On the other hand, U.S. policy and the international non-proliferation regime have imposed costs and obstacles that have induced Indian leaders to constrain their capabilities.

U.S. reluctance to pursue nuclear disarmament seriously has imposed an additional political and strategic handicap on nonproliferation policy toward India. To be sure, U.S. officials and strategists argue plausibly that India has used inadequate disarmament progress as a pretext for its own weapons program. In this American view, the nuclear postures

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and policies of the United States and the other declared nuclear weapon states have no real security bearing on India's policies and are therefore irrelevant to the unproliferation problem. However, even if this were true, the argument misses the fundamental point: decisions to stop or roll back a nuclear weapon program are profoundly political, especially in a democracy. Even if the five declared nuclear weapon states pose no genuine security threats affecting India's nuclear policy—including China, whose nuclear posture is linked to those of Russia and America—strong political links connect the five to India. Political parties in democracies, especially ambitious post-colonial democracies like India, will insist that their governments seek equity in international relations. The equity imperative applied to nuclear policy has meant that India would not stop or abandon its nuclear weapon and missile programs without concomitant nuclear disarmament by the five "major" powers. American policy-makers and analysts thinking and acting within a security-first narrative have failed to appreciate that India and other states have seen nuclear policies primarily through a political narrative. The Indian experience suggests that the United States and the other four nuclear "haves" cannot indefinitely keep other states from acquiring nuclear weapons unless the five reverse course and dedicate themselves to creating the conditions for the elimination of nuclear weapons. The contrary view constitutes one of the illusions that India has exploded, as discussed more fully in the concluding chapter.

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POLICIES PROGRAMMES AND INITIATIVES

SCIENCE AND TECHNOLOGY AND OCEAN DEVELOPMENT

Science and Technology

The most important decision was to raise the allocation for research and development to 2 per cent of Gross Domestic Product (GDP). The present R&D share in the GDP is about 0.7 per cent. In the current year itself it will be raised to 1 per cent and gradually to 2 per cent within five years. This decision was announced by the Prime Minister while inaugurating the Indian Science Congress in Pune on the January 3, 2000.

All the 21 projects identified under the Jai Vigyan Mission have been put on fast track and completion in a time bound schedule. Many of the projects are under various stages of implementation and these relate to Space, Atomic, Bio-technology, Genetic Engineering, Electronics, Science and Technology, and Ocean Development.

New Agreements

The Government also decided to extend the Integrated Long-term Programme of Cooperation with Russia in Science and Technology for another ten-years. Under it India will be

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supplying PARAM-10000 Super computers to Russia while Russia decided to provide India the technology for manufacturing silicon wafers, among other things.

In a bid to renew and strengthen scientific and technological cooperation with developing countries, agreements were signed with a number of nations including Cuba, Myanmar, France, United States and Estonia.

India also went in for a special agreement with France for the setting up of Laser Technology Centre at Hyderabad besides cooperation in ground water research.

In a significant development an Indo-US Meteorological Data Centre was set up at the India Meteorological Department in New Delhi. All US and Indian satellite based meteorological data will be made available here for research and analysis by scientists from both sides.

In another move the Government signed a MoU with Germany to give a thrust to joint technology transfer to developing and underdeveloped countries. This came about during the observance of 25 years of Indo-German scientific cooperation.

Encouragement to New Scientists

To encourage young scientists, the Government announced the Swarnjayanthi fellowships. Six scientists were awarded the fellowships for 1999. They will get an attractive fellowship amount of Rs. 25,000 per month and other support for research in frontier areas of science.

Two special awards were also announced in science for women, marking the dawn of the new millennium. One is for a woman who has made outstanding contribution for the benefit of women through the application of science and technology and the other for a distinguished woman scientist for outstanding contribution in science.

The Government also decided to set up more technology parks for women. These parks will have on display various

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kinds of tools and implements which are useful to the rural women folk in their day to day chores and help in eliminating drudgery.

New Scientific Adviser

Another important decision was elevating Dr. A.P.J. Abdul Kalam as the Principal Scientific Adviser to the Government of India with a Cabinet rank. He will advise the

Government on overall scientific development in the country and on issues relating to scientific and technical policy in different sectors. Dr. Abdul Kalam was earlier scientific adviser to the Defence Minister.

Bio-technology

Significant decisions were also announced by the Government in bio-technology, with focus on developing new vaccines particularly malaria and HIV and on plant biology and genomics including human genome. In case of plant biology, the emphasis will be on rice and mustard. The Government announced that adequate funds would be made available for programmes of bio-technology.

New Collaborations

India has entered into collaborative arrangements with the National Institute of Mental Health, USA and the Brain Research Centre RIKEN - Japan for research in neuro-sciences including brain research. Efforts are also being made to have similar arrangements with other developed and developing countries in this area. This will help the Indian scientific community to work on a common platform at international level in brain research.

National Centre for Plant Genome Research

It was decided to set up a national centre for plant genome research and foundation stone for it has been laid at the JNU complex, New Delhi. This centre will be developed as a pioneer research institute of plant molecular biology in

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the country. It will also help in providing quality research comparable to any international standards.

New Vaccine

A new vaccine has been developed to check the new-castle disease virus which affects birds like chicken and pigeon. The vaccine has become a boon to the poultry industry which was under a severe threat from the new-castle disease. The National Research Development Corporation, India's premier technology transfer organization is taking up the commercialization of the vaccine.

A data bank has also been set up in Delhi to identify genes and help facilitate patenting. Micro propagation techniques were also transferred to industry.

National Bio-resource Development Board

Another important decision taken concerning bio-technology related to setting up of National Bio-resource Development Board. This is with an aim to scientifically develop and at the same time preserve bio-resources of the country. The Government will soon come out with some policy decisions concerning this and all projects under the bio-resource development programme would be cleared as "green channel" projects.

Ocean Development

A massive one-time exercise has been taken up to have India's seabed boundary established under the delimitation of the continental shelf. Under it, India can stake claim to lakh of square miles of seabed area which can be used for oil exploration, seabed mining and fishing.

India has been chosen to be the regional centre for the implementation of the project "storm surge disaster reduction in the Northern Indian Ocean area". This came about at a regional meeting hosted by India for the first time on cyclonic disaster reduction. A plan of action was also formulated for the member states.

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Expedition to Antarctica

India launched the 19th scientific expedition to Antarctica from Cape Town in South Africa. This is the first time in the history of Indian polar programme, the department of ocean development decided to launch the expedition from Cape Town keeping in view scientific, economic and international cooperation with South Africa in mind. In addition to on going programmes, several new experiments relating to study of Earth - Air current systems, global climatic changes etc. were added.

The Department is putting up a demonstration plant off Tuticorin for the conversion of ocean thermal energy into electric power. The plant will become operational later this year.

A special satellite IRS-P4 (OCEANSAT) was successfully put into orbit for exclusive atmospheric, oceanographic and meteorological studies.

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DEVELOPED NATION : THE VISION*

INTRODUCTION

I am indeed delighted to give the First P.N. Haksar Memorial lecture. Despite his great stature in the national scene, I was fortunate to come in contact with him when he was a member of the space commission and visited the satellite launch vehicle integration lab at Thumba, where multiple systems were getting integrated and prepared for launch acceptance. At that time he was the Principal Secretary to Prime Minister. With smoke coming out of his pipe, and with a smiling face, he asked an important question: In satellite launch vehicle programme where does India stand ? I looked at Prof. Satish Dhawan, the then Chairman, ISRO and then quickly responded to him saying that when the Rohini Satellite in injected SLV-III in earth orbit, we will be the 5th country ! Oh' my Nation when you will be the first" ? His words - "when my nation will be the first" reverberates in my mind even after nearly 20 years. When we launched AGNI missile system in 1989 again we were the 4th country to have perfected re-entry technology. When we conducted the nuclear tests and declared India a nuclear weapon state, India was the 6th country. How do we come out from this 4th, 5th, 6th, country syndrome, to the dream

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* Dr. A.P.J. Abdul Kalam, Scientific Advisor to Raksha Mantri and Secretary, Deptt. of Defence R&D Ministry of Defence, New Delhi.

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of Shri P.N. Haksar of India becoming the first country in certain technology areas.

The concepts and doctrines for the welfare of the nation can be generated by a few thinkers and scholars. What is needed is who can translate this concept and ideas into action to produce results. Shri Haksar in the book "A Basket of Fallen Leaves" has brought out this concept beautifully. He says " As Mahatma Gandhi astutely observed, no cause can triumph unless there are faithful agents to carry it through. The assembling together of such faithful agents articulating the urges for social, economic and political transformation is the major issue before our country". This statement of Shri Haksar is true for technology, political field, industry and societal upliftment. So it is a honour to remember this great son of India and give this memorial lecture. The triggering thoughts of Shri Haksar on the need for faithful agents led me to think 'When my country will become a "Developed Nation". ? Hence the Topic for today's talk is "DEVELOPED NATION: THE VISION"

Technological Thrust

During the days of cold war, a predictable state of bi-polar world order was getting established with the UN forum providing the necessary platform for maintaining a sense of balance between the nations of the world. The discriminatory or restrictive laws of the western block of developed nations seemed justified on the basis of denial of technology to the specific nation. However, after the collapse of the Soviet Union, this east-west axis has taken a north-south orientation and the export controls and technology denial regimes now are directed mainly to the developing nations including India, to maintain the techno-economic superiority of the advanced countries, with political tone.

Today, we encounter twin problems. On one side, there is a large-scale strengthening of our neighbours through supply of arms and clandestine support to their nuclear and

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missile programmes, and on the other side all efforts are being made to weaken our indigenous technology growth through control regimes and dumping of low-tech systems, accompanied with high commercial pitch in critical areas. I always wonder at the logic of technology control regimes and how the world can silently witness and accept such a logic. Some countries can develop, stockpile and even proliferate, but we should not develop anything even for our defence. They can have weapons and carriers because they already have weapons and the others should not think of them, even when their security and sovereignty is threatened.

Growth of indigenous technology and self-reliance are the only answer to the problem. Technology not only leads to advanced systems and products, but also is the main engine for economic build-up and national development. A club of G-8 has emanated among themselves. The western industrially developed countries, therefore, set themselves on a path of accelerated techno-economic development. Therefore, in the present global scenario only strength respects strength. There is no doubt, indigenous technology development is the only key for India to attain fast economic strength. The need of the hour is technological excellence and self-reliance.

We have been able to overcome the technology controls and design and develop our own system. We have been able to develop core competence in many strategic areas like the space, missiles, nuclear technology, super computers and many such areas. We have been able to demonstrate our capability in several high technology systems. Nuclear tests, AGNI missiles, what India can learn from this, beyond technological accomplishments. These developments show our "will" to be strong and self-sufficient to be independent from the fear of external threat and aggression to be able to have the freedom of deciding our own destiny and foreign policy without being dictated.

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The urgent issue that we need to address collectively as a nation is how do we handle the tactics of economic and military dominance in this new form. Today technology is the main driver of economic development at the international. Therefore, we have to develop indigenous technologies to enhance our competitive edge and to generate national wealth in all segments of economy. Therefore, the need of the hour is arm India with technology.

Let us now explore how to arm India with technology not only for the purposes of defence and internal security, but also for food security, economic and social security of the nation and people. The vision for the nation is to transform India into a developed country within two decades.

VISION FOR THE NATION

First Vision : India's freedom

India laid the seeding of independence in 1857. Freedom movement was the first vision for the nation. It took 90 years to get the freedom using multiple methodologies to vacate foreign powers. The vision generated leaders across the political spectrum, many scientific leaders, industrial leaders, literary giants, great economists and several accomplished persons. In science and technology area a remarkable event took place during 1920-25 in India. Internationally well known scientists were enriching the nation. They were Professors J.C. Bose, C.V. Raman, Meghnad Saha, Srinivasa Ramanujam and Subramanyam Chandrasekhar. In the book "*Chandra*", Prof. Subramanyam Chandrasekhar, describes "I mean it is a remarkable thing that in the modern era before 1910, there were no (Indian) scientists of international deputation or standing. Between 1920 and 1925, we had suddenly five or six internationally well known men. I myself have associated this remarkable phenomenon with the need for self-expression, which become a dominant motive among the young during the national movement. It was a part of the national movement to assert oneself. India was a subject

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country, but in the sciences, in the arts, particularly in science, we could show the west in their own realm that we were equal to them."

Independent India was born in 1947 with a label attached that it is a "developing country" pointing the fact that it is not economically strong; there is a high dependence still for defence systems. India has no world standing among the nations, in spite of its size and potential. Therefore, the question arises as to how we physically and spiritually remove this label of 'developing country' and become a 'developed India' in two decades of time. Independence was the first vision realized by the nation and its people. On that foundation we need to build the second vision of becoming a developed India with national, economic, food and social security.

Developed India - How to realise?

With this vision of Developed India let us look at what we should do to reach that status. It is a second major movement for the country after the great independence movement.

In a movement everybody has a role. Form the TIFAC document Technology Vision 2020, five thrust areas around which we can take several econo-technological actions involved in such a movement:

1. Agriculture and food processing;
2. Reliable and quality electric power for all parts of the country;
3. Education and health-care;
4. Information Technology; and
5. Strategic sectors.

These five areas are closely inter-related and lead to national security, food security and economic security.

Integrated action

I wish to suggest how each and every Indian, in different walks of life, can contribute towards realizing the vision for

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the nation. I had discussions with economists, agricultural experts, technologists from different fields, from industry, government, administrators at various levels, non- governmental professionals and activists, media persons, and political leaders at different fora. After discussions, I feel concerted efforts in the five areas mentioned earlier can lead to a major movement towards transformation of the nation.

Integrated action

Agriculture and food processing

India should have a mission to achieve a production of a minimum of 360 million tons of foodgrains in two decades. This will allow for good domestic consumption and still leave a sufficient margin for food exports and aid to other countries. This mission will demand a great revolution in research, technology development, agricultural extension services, and above all a major network of marketing, storage and distribution.

Electric power

This is the most important part of the infrastructure. Besides assuring people of domestic comfort, it is imperative for increasing food production, and to support a whole host of manufacturing operations, in the engineering, chemical and material processing industries, as well as in the smooth operation of the entire transport, communications and information sector, all of which are vital to economic growth and employment. The growth of a nation's GDP is vitally linked to the availability of electric power. India's installed power capacity today is about 85000 MW. Only about 32000 MW reaches the consumer. There is shortage of about 15 per cent in the peak power requirement. The requirement of electric power will only multiply because of the growth in the demand from various sectors. Immediate action is needed to greatly step-up the generation of electricity from coal, gas, hydro, nuclear and non-conventional energy sources.

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Research on non-conventional and nuclear sources of energy has to be enhanced, for the reason the fossil fuels may exhaust in a few decades as predicted by experts.

Apart from generation of power, another major mission is to ensure its efficient transmission. The consumer is interested in the actual quality of power that is available, and not in the statistics of the installed capacity of generation. Here the technologies and systems management for countrywide distribution is of crucial importance.

Consumers too have to be careful. Precious power should not be wasted by inefficient equipment, fans, lights or other industrial and domestic appliances or agricultural equipment. Therefore, technologies for energy-efficient and use appliances are of crucial importance to India.

Education and health

Kuppu and Karuppan in our book *"India 2020: Vision for the New Millennium"* as mentioned earlier in my talk, represent about 60 per cent of India's population. These two have the urge and the willingness to work hard. But because of the lack of education they are unable to utilize the available opportunities for better employment or to improve their standard of living. People like Kuppu and Karuppan have to break out of their educational handicap. The lack of educational opportunities and their poor quality of life perpetuates their poverty. Educated parents will never like to have uneducated children, as their future generation. Is it not true? Non-availability of preventive health care farther weakens their bodies and, therefore, their capabilities. Can we break this vicious circle?

Prof. Indiresan, who led the TIFAC (Technology Information, Forecasting and Assessment Council) panel to identify the driving forces and impedances, has tried to point the way out. Indians should be provided access to first-rate education and skill development opportunities. This cannot

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be done by the prevalent methods of village schools or other schools and institutes in towns and cities. We need to create clusters of villages with excellent internal connectivity through roads and communications which are also linked to near by urban centres. These rural clusters would have quality centres of education, and health support facilities. People can easily commute between the villages and acquire the best skills and education. Their access to well-equipped health care centres will be the necessity. These centres would have the knowledge base to advise them on preventive health care methods. The teachers or medical personnel in these quality centers would also have access to other experts in India and even abroad through communication connectivity. Let us not forget India's excellent achievements in satellite communications. Besides technological expertise, what is required is good political and managerial leadership all over the country to implement this mission. Let not the children and grandchildren or Kuppus and Karuppans be handicapped. We can achieve an India without such handicaps by 2020.

Information Technology

In the "Technology Vision" document, software engineering and associated IT products and services are important core competencies. Fortunately, already a decision has been taken at the national level to make India an information technology power in about a decade. When this task force of IT is deliberating its final report, two important items are essential to be considered by them for special action. All of us feel that India has the intellectual power for higher levels of software. High level software provides a challenge to our best minds and at the same time it is a wealth generator. This should be focused upon as a mission area in IT. If the necessary enabling conditions are provided, this single area can transform out IT, electronics and manufacturing sector into a major economic entity. Another item relates to actions for the spread of IT applications countrywide for purposes

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ranging from boosting business to spreading knowledge about fundamental rights and responsibilities, impart skills, to provide preventive health care information and for several such items pertaining to acquiring a better standard of living. It can be a vary useful tool for transmission of education to even the remotest parts of our country. India's system of education and skill-generation can be transformed in a decade if we can creatively and purposefully deploy IT technologies.

Strategic Sectors

To reach the status of a developed India, in addition to the four mega-missions mentioned before, there is an equally important mission for national security. In today's environment, national security is derived from the techno-logical strength of the nation; that alone will give us the real strength. It is India's experience, be it in agriculture or in the areas of the nuclear space and defence research, that when visionaries set a mission, results are achieved. This strength is to be further expanded with die creation of a few major industries in aerospace, advanced electronics, advanced sensors and advanced materials. These industries should operate in a market-driven environment winning global markets. For example, India should be in the business of building small passenger jets even with an international consortium. Likewise, we should be in the business of selling satellites and providing commercial launch services. Marketing of aerospace systems, providing aircraft subsystems, maintenance services to global customers, as well as business in products with advanced sensors and advanced materials, should become a part of our normal business. We should also begin aggressive marketing of various defence systems such as main battle tank, guns, LCA type aircraft, certain types of missiles and nuclear power stations. The thrust towards self-reliance should be coupled with global marketing, as the developed world force upon us. Such an approach should become the focus in the strategic sector.

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In this direction, the Ministry of Defence has a self-reliance mission of realising 70 per cent indigenous defence systems by 2005, from the present 30 per cent. To achieve this target, the defence R&D and production infrastructure are already geared up and the partnership of Indian corporate sector has been sought to accomplish this major task. Similarly, other departments having technologies to establish major industries which serve the multiple needs of domestic and global markets. Every department of Government of India must be mandated to dual use technologies, which is a pre-requisites of protect these hard-earned wealth.

Implementation

My suggestions for these major five missions, do not envisage the present methods of departmental implementation or expanding the governmental structures. In order that India marches towards the cherished goal of a developed nation, there is an urgent need to change the present methods of working and the mindset that has developed because of centralized managerial system. Many existing government structures would need to be drastically reduced. There should be reduction of monopolies and a greater competition in the implementation of many packages of these mega-missions. Therefore, private sector participation would be required along with more liberal and simplified procedures, healthy competition leads to greater efficiency and innovation. Empowerment of implementing teams would lead to speed in action and enhance capability to take risks. Wherever there is a government presence, its mode of operation should be made a facilitating one and the public accountability systems should be changed accordingly.

I believe, that the five mega-missions when integrated and implemented with a national focus, will result in actions which will shape the second vision of the nation. The necessary financial, managerial and human resources would

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flow from those whose minds are ignited, including those in the government and industrial sectors.

The vision for a developed India is driven fully be economic development coupled with security needs of the nation. It is also important that the intellectuals of the nation is equally reinforce. What it means is India due to its ancient civilization, in spite of over-powering from various invading nations, the intellectual wisdom needs to be sprung back matched with Indian value system. The intellectuals' mighty minds built-in self-confidence with compassing for the service to poorer section and the most important demand for a developed nation-happy society.

Self-Reliance in Technology and National Strength

I would like to share with you certain experiences, I had the occasion to participate and understand. This happened in a year's period. On 11th May 1998 the Chairman, Atomic Energy Commission, Dr. R Chidambaram and myself and some of our team members were working for the results of the underground nuclear test followed by another two. We were very close to the test site and countdown was progressing. At T-5 seconds and hundreds of parameters for instrumentation were displayed. The mission was to takeplace in a few seconds. At T-O the event. We witnessed the whole earth shrugged, thundered in front of us and all around. We saw part of the earth raising. What a powerful energy India generated through nuclear weapons? This successful mission was the great partnership of DAE and DRDO. Self-reliant technology made the nation to become a nuclear weapon state.

The second event is to do with a missile system. On 11th April this year the AGNI-II took off with computer command from the beautiful island range. 600 parameters were monitored in real time through a series of radars and telemetry stations and ship borne instrumentations inter-

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linked through our own communication satellites. The AGNI with its payload reached with close accuracy on the target 2000 kms away. The partnership of DRDO labs, academic institutions and industries brought this important success and it is triumph for self-reliance, in spite of the technology denial.

Another event is about India's rocket technology. It reached its prime when the ISRO launched successfully the operation Polar Satellite Launch Vehicle on 26 May, 1999. The PSLV, that has the third largest booster in the world, and above all the ISRO reached a stage of integrating its own satellite IRS, a German and a South Korean satellite. India can compete in the launch vehicle programme for launching other countries, satellites also. This the result of a great visionary Prof. Vikram Sarabhai on self-reliance.

Another area of India's core competence is the information technology. Within 5 years time our software product potential has increased from a few hundred million dollars to four billion dollar, more than half of which are exported. Some of our software companies have been recognized as equal professionals in various software export houses in the world. All these events, I am narrating to the young community because, if India decides and work for it we can do it.

When TIFAC brought out the Vision Document evolved by 500 experts and submitted in 1996, one major question often asked was the tasks are bigger and people are not to the same dimension. The nation is still not prepared how such a vision of developed India can be accomplished. In my lecture I was presenting our national core-competence and also wherever we decided we can, India will do it and India has done it. For the realisation of the Vision two important factors have to enter into our psyche and minds. They are: the self-reliance in thinking and actions and a national decision that India should become a developed nation.

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Concluding Remarks

Few dream and many transform it into thoughts and thoughts have be transformed into actions. I would like to tell particularly to the young audience of this gathering, the vision is bigger than us. The developed India needs a revolution in the minds of the young. Enter into it. Ignited minds are indeed the powerful resource to transform this nation from the developing nation of 50 years into a developed nation in less than two decades times. Technology is the prime mover for the vision for the nation.

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CURRENT EVENTS

KALAM TO FOCUS ON YOUNGSTERS

India's rocketman A.P.J. Abdul Kalam, who resigned as the principal scientific advisor to the Centre, has set himself a target of interacting with 100,000 students during the next two years throughout the county to help them to realize their dreams and mould their future.

He said, "I feel comfortable in the company of young people, particularly high school students Henceforth, I intend to share with them their experiences, helping them to ignite their imagination and preparing them to work for a developed India for which the road map is already available."

Kalam's sudden resignation has triggered speculation scientific and academic circles that the decision might have been prompted by strong differences with the government on some issues. His place is being taken by former atomic energy commission chairperson R. Chidambaram who described Kalam as an "illustrious colleague and a good friend".

Both were key players of 'Pokhran-2', the nuclear weapons test conducted in May 1998 Kalam is quoted in an agency report as saying that India possesses a hydrogen bomb and its nuclear weapons are absolutely safe.

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The man who plays the *veena* with one hand and launches a rocket with the other, dismisses any suggestions that differences with the government led him to quit. He said that during the last 43 years he enjoyed a cordial relationship with the government. "I decided to resign because I felt I have finished my task with the government and the time has come for me now to focus my attention on youngsters," he said.

He reiterated that he always wanted to be associates with youngsters and pointed that in 1991 there was a move to make him the vice chancellor of Madras university. But for some reason the plan did not materialize. "In my autobiography *Wings of Fire* I have explained my desire to be with youngsters on whom I have great faith," he explained.

He said in the next few days he will be moving to Bangalore where he will be occupying the Brahm Prakash chair at the Indian Institute of Science. Prakash a nuclear and space scientist, was a role model for Kalam. At one time he was director of Vikram Sarabhai Space Centre at Thiruvananthapuram.

Kalam said he was looking forward to his new assignment at IIS since he will be able to enjoy complete freedom in the environment of an academic institution. "I will guiding students in their projects. I also want to help the scientists fulfill some of their future mission," he stated. Kalam preferred not to elaborate about these missions.

For Development

Declaring that India possessed both "fusion and fission" nuclear bombs, A.P.J. Abdul Kalam said these weapons were "for deployment".

"Every weapon is made, you know it is not for storing but for deployment." Kalam told the media and defence

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research community when asked whether India had command and control system in place for nuclear weapons.

Source : *Times News Network, November 11, 2001.*

INDIA HAS HYDROGEN BOMB : KALAM

India possesses a hydrogen bomb and its nuclear weapons are **"absolutely safe"**, noted scientist, Dr. A.P.J. Abdul Kalam, who demits office as Principal Scientific Advisor to the Government, said.

"Scientists and technicians who conducted the Pokhran II tests in 1999 are all satisfied with the results and we have a thermonuclear device." Dr. Kalam said.

Asked about the safety of nuclear assets, 70 year-old Dr. Kalam, who holds a Cabinet rank, said "safety standards are in-built in our country. We possibly have much better safety standards than many others".

On whether India should develop missiles with strike ranges longer than 'Agni-II', which can reach a target at a distance of over 2,200 km, he said, "it depends on what kind of enemy the country faces and its strategy for the next 10 or more years. India is capable of manufacturing (a longer range missile) if the necessity arises".

Dr. Kalam, who will be succeeded in the key post by Dr. R. Chidambaram, former Chairman of the Atomic energy Commission, said he was quitting his job as he wanted to work with younger people and high school students to create a scientific culture and push India to a developed nation status.

"Change, I believe, is very important in a man's life. Change allows a person to contribute very effectively," Dr. Kalam, who worked in key defence and space centres for the last 43 years, said.

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Source : *Press Trust of India, November 11, 2001.*

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NO REVIEW OF N-WEAPONS POLICY: CHIDAMBARAM

The nuclear scientist, Dr. R. Chidambaram, today asserted that the nuclear tests at Pokhran were "eminently successful" and ruled out any review of the country's nuclear weapons policy, saying that India had now developed a credible nuclear deterrent.

Addressing a press conference soon after taking over as the new Principal Scientific Adviser to the Government, he said the country's nuclear programme had a "mature and strong foundation," and since the Pokhran tests the country had made good enough progress in the development of nuclear weapons. It also had a well-defined missile development programme.—Dr. Chidambaram.

Replying to a question. Dr. Chidambaram said the U.S. sanctions on transfer of dual use technology had "minimal or no-effect" on the country's nuclear programme as "our self-reliance is very high.

On doubts expressed by some U.S. and other Western agencies about the yields of the Pokhran nuclear test, he said all seismic and other data collected from the site had proved that it was "eminently successful." "Some Americans may doubt India's achievement. But there are also some others who agreed with us."

Asked about Dr. Kalam's claim that India had conducted a hydrogen bomb test in 1998, he said India had tested five devices, which included one fission device, one two-stage thermonuclear device or what is called the Hydrogen bomb and three sub-kilo devices, each less than one kilotonne.

To a question on claims by the fugitive terrorist Osama bin Laden of possessing nuclear weapons technology. Dr. Chidambaram said development of nuclear weapons involved a number of processes and only nation-states had the capability to design and maintain nuclear weapons.

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To another query, he said he gave his full backing to the proposal of the Indian Space Research Organization Chairman, Dr. Kasturirangan, for a mission to the moon. The country had the necessary capabilities and the mission would have several positive spin offs. "India is too big a country not to be present in any field of science and technology."

Source : *Times of India, November 15, 2001.*

ANSARI'S PLAN: KILL KALAM, KIDNAP SACHIN*

Investigations by the Crime Branch of the Delhi Police have revealed that members of the ISI-backed Aftab Ansari group - which claimed responsibility for the attack on the American Center in Kolkata - had planned a series of high-profile kidnappings, murders and terror strikes in India. On the hit-list were such people as former scientific adviser to the Prime Minister A.P.J. Abdul Kalam, cricketers Sourav Ganguly and Sachin Tendulkar.

According to a Crime Branch note (a copy of which is with the *Hindustan Times*) Ansari had plotted to assassinate Kalam few months ago when he was in Bihar. Hitmen had shadowed Kalam, but had to abort the plan because they couldn't acquire enough weapons in time.

Ansari's plan for Tendulkar was straightforward: kidnap the batting legend for ransom. But he wanted Ganguly abducted so that he could trade the Indian cricket captain for the release of Mohammad Amir Khan, a Lashkar-e-Tayyeba (LeT) terrorist who is in Tihar jail.

The Crime Branch note is dated January 23, but was evidently prepared the day before (when the American Center attack took place). Delhi Police's information was shared

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* Neeta Sharma.

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with the Kolkata Police and clearly taken seriously: security was beefed up around Sourav Ganguly's South Kolkata home by the evening of January 22.

Although Ansari operates out of Dubai, the Crime Branch note says he is currently in Islamabad's Qasim Bazar area. It also talks about his connections with several terrorists. These links were forged primarily in Delhi's Tihar jail where Ansari was an inmate (till he got - and jumped - bail in 1998) on multiple kidnapping and murder charges.

Ansari met terrorists like Omar Sheikh of the Jaish-e-Mohammad, Mufti Kifayatullah of the Harkat-ul-Jehadi Islami (HUJI) and Abdul Karim of the LeT, among others in Tihar. He is also married to a sister of Tahir, a Kashmiri militant whom he met in jail.

It seems Ansari, who has a base in Dubai, wanted to trade his local influence for training and arms from foreign terrorist outfits. He, along with Asif Reza Khan who helped Ansari abduct Kolkata shoe baron Partha Roy Burman and was killed in an encounter in Gujarat, went to Pakistan to renew contacts with several terror groups and assured them help in anti-India activities. The pact was limited to mutual cooperation - the two refused to bring their activities under terrorist control.

The foreign terror groups and the ISI could hardly have asked for anything better. Ansari's criminal network could turn out to be an excellent cover, they reckoned. Having got the go-ahead from Pakistan, Ansari sent several youths for training to the LeT camps. He also established a large network of hideouts and operatives in India. On Ansari's map were Mumbai, Hyderabad, Delhi, Kolkata and Hazaribagh.

In fact, the Delhi Police shared information about the Hazaribagh hideout with the Jharkhand police on January 22, and the joint operation that saw two of Ansari's men

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killed on Monday in the Bihar town was planned days in advance.

The Delhi Police had suspected the involvement of Lashkar militants all along and Mohammad Idris, alias Zahid, who was shot dead in Hazaribag, had said in his dying declaration that those who carried out the attack in Kolkata were LeT terrorists.

On the Hit List

- A.P.J. Abdul Kalam
  Ansari planned to assassinate the man behind India's missile development programme.
- Sourav Ganguly
  Ansari planned to abduct him in order to secure the release of a Lashkar terrorist.
- Sachin Tendulkar to raise funds for his group, Ansari planned to abduct the Indian batsman.
- BARC, Trombay
  Ansari group planned a massive attack on the Bhabha Atomic Research Centre

Source : *The Hindustan Times, January 29, 2002.*

ABDUL KALAM IS NDA CHOICE*

Eminent scientist and father of the country's missile development programme A.P.J. Abdul Kalam emerged as the unanimous choice for the post of the nation's next President as the ruling National Democratic Alliance (NDA) tonight agreed on his name and decided to make him the official candidate.

Professor Kalam, who has been at the forefront of the country's scientific developments, including the missile

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* Satish Misra and Rajeev Sharma.

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development programme, emerged as the NDA's choice after it became virtually impossible to press ahead for Maharashtra Governor P.C. Alexander for the country's highest post.

Mr. Alexander was not only being opposed by the Opposition, including the Congress and the Left parties, but the Maharashtra Governor, who was the choice of the Mumbai club of the BJP-Shiv Sena combine, failed to gain favour with some of the allies like the Telugu Desam.

Professor Kalam's name was cleared at the NDA meeting held at the Prime Minister's residence which was attended by Andhra Pradesh and Uttar Pradesh Chief Ministers N. Chandrababu Naidu and Mayawati, respectively.

The candidature of the eminent scientist, who was also the scientific adviser to the Government of India, found favour with the Congress also with party spokesman Jaipal Reddy terming it as a "positive achievement".

AICC sources said the Congress was likely to back Professor Kalam as he was non-controversial and belonged to a minority community. Professor Kalam's candidature would be supported by the Samajwadi Party and it would be difficult for the Congress to pull off a victory in case of a contest. Though Congress leaders had been insisting that if President K.R. Narayanan agreed to a second term, he would be their candidate, they are likely to support Professor Kalam now.

The noted scientists name became a strong possibility when Mr. Naidu tonight supported the candidature of Professor Kalam saying that he was the "right and appropriate" choice.

Professor Kalam's "stature and his contribution to the country's self-reliance in science and technology and other fields make him the best candidate around which a consensus can be built," he said.

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Decorated with the country's highest civilian award Bharat Ratna, Professor Kalam's name was proposed by the Prime Minister to Congress chief Sonia Gandhi when the two met in the evening today.

During the 15-minute meeting, Mr. Vajpayee said the government had made up its mind to field Professor Kalam for the country's top post, senior Congress leader Manmohan Singh, who was also present, told reporters. The Prime Minister also met Samajwadi Party chief Mulayam Singh Yadav and suggested to him that Professor Kalam was the government's choice. Later Mr. Vajpayee spoke to CPM and CPI General Secretaries H.K. Surjeet and A.B. Bardhan, respectively, on the telephone.

Professor Kalam's case was further strengthened with the People's Front deciding to meet here tomorrow to discuss and decide its stand on the presidential elections in the light of the NDA's move to nominate him, CPM leader Sitaram Yechury said.

The BJP also welcomed Professor Kalam's name as the next President saying that the party "considers him to be the most eligible and appropriate candidate".

"It is the most appropriate decision. Any nation would be proud to have such a President," party National Secretary and former Union Minister Mukhtar Abbas Naqvi said.

Mr. Naqvi said it would be "very unfortunate" if the Congress and other Opposition parties opposed the candidature of "such a non-political and non-controversial" person.

Even the Sangh Parivar and the Shiv Sena welcomed Mr. Vajpayee's decision to nominate Professor Kalam for the post of President describing the noted scientist as a "diehard nationalist who has earned a special place in the hearts of the people of India."

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"We would be very happy if Professor Kalam is elected President of India unanimously. He has contributed a lot to science and technology and people in general have great respect and reverence for him," RSS co-spokesman Ram Madhav said.

VHP international general secretary Praveenbhai Togadia said, "The choice of Professor Kalam shows that this government does not discriminate on communal lines if the person concerned is a diehard nationalist." "We hope that Professor Kalam's elevation to the highest office would take the country forward in the field of science and technology as also put an end to the Hindu-Muslim problem," Togadia said.

In a statement, senior Delhi Shiv Sena leader Abhimanyu Gulati welcomed the choice of Professor Kalam for the top post saying that "we have always supported and encouraged nationalist Muslims. The government's choice is a slap on the face of the pseudo-secularists who allege that we discriminate on communal lines."

Earlier, Mr. Yechury told newspersons that it was the display of the Opposition unity that forced the ruling NDA to choose a consensus candidate for the top post.

After the BJP's efforts to unilaterally impose a candidate failed, it made a hasty retreat and chose a candidate acceptable to all, he said. Further pressed Professor Dr. Kalam's candidature, Mr. Yechury said no one would oppose him as he was a noted scientist and intellectual.

Asked about President K.R. Narayanan's candidature proposed by the Front, Mr. Yechury said it was because of the fact that the Prime Minister's Office tried to impose the NDA's choice without caring for a consensus and decided to field Maharashtra Governor P.C. Alexander.

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Earlier, the Prime Minister replied in the affirmative when the Congress President enquired whether Professor Kalam's name for the post was final as the government had earlier proposed the candidatures of Vice-President Krishan Kant and Maharashtra Governor P.C. Alexander, he said.

Mrs. Gandhi told Mr. Vajpayee that "we will let the government know of our views after consulting senior party leaders."

Dr. Manmohan Singh said Mrs. Gandhi told Mr. Vajpayee that she would hold consultations with her senior colleagues and others on the issue. Asked about the Congress choice for the top post, Dr. Manmohan Singh, said, "We have so far said President K.R. Narayanan is our preferred candidate, but now we have been given a new name and we have to reflect on that."

Source : *Tribune News Service, June 10, 2002.*

CONG. SEEKS TIME TO DECIDE ON KALAM

Prime Minister Atal Behari Vajpayee today met Congress chief Sonia Gandhi and proposed the name of noted scientist A.PJ. Abdul Kalam for the post of the President.

During the 15-minute meeting at his residence, Mr. Vajpayee said the government had made up its mind to field Mr. Kalam for the country's top post. Ms. Gandhi told Mr. Vajpáyee that she would hold consultations with her party leaders on the issue.

Senior Congress leader Manmohan Singh, who was also present at the meeting, said that the Prime Minister replied in the affirmative when the Congress president enquired whether Mr. Kalam's name for the post was Final as the government had earlier proposed the candidatures of Vice-President Krishan Kant and Maharashtra Governor P.C. Alexander.

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Ms. Gandhi told Mr. Vajpayee that he had given a new name and "We will let the government know our views after consulting senior party leaders."

Asked about the choice of the Congress for the top post, Mr. Manmohan Singh said, "We have so far said President K.R. Narayanan is our preferred candidate but now we have been given a new name and we have to reflect on that."

To a question whether the Congress would "dump" Mr. Narayanan, he said "there is no question of dumping him."

Besides Ms. Gandhi and Mr. Manmohan Singh, Home Minister L.K. Advani was present at the meeting.

Earlier in the day, Congress chief spokesman Jaipal Reddy had said that the party had neither opposed nor approved the name of Mr Abdul Kalam as yet.

Source : *Tribune News Service, June 10, 2002.*

CONG. TO DECIDE ON KALAM TODAY

President K.R. Narayanan told the Congress that he would not seek a second term in office, even as the main Opposition party said it would tomorrow take a decision on whether to support the candidature of Dr. A.P.J. Abdul Kalam for the country's top post.

Senior Congress leaders Manmohan Singh and Natwar Singh met Mr. Narayanan this evening to know his response on the proposal to become the Opposition candidate in the presidential poll. Congress chief spokesman Jaipal Reddy said the President refused to enter the fray.

After meeting the President, Mr. Manmohan Singh and Mr. Natwar Singh came to the residence of Congress President Sonia Gandhi where senior party leaders were finalising the party's strategy for the presidential poll.

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They reported Mr Naraynan's decision after which Ms. Gandhi decided to convene a meeting of the CWC to finalise party's response to the candidature of Mr. Kalam who is the nominee of the NDA and also enjoys the backing of the NCP, Samajwadi Party, RJD, BSP and AIADMK.

Source : *Tribune News Service, June 11, 2002.*

BJP FLAYS PF STAND ON KALAM

The BJP criticised the Peoples' Front (PF) for its hesitation in supporting a capable and non-controversial candidate like A.P.J. Abdul Kalam for the post of President.

BJP spokesperson and General Secretary Maya Singh said Dr. Kalam was probably the first-ever scientist to become a Head of State and it was strange that the Opposition, instead of instantly extending support, was delaying its decision.

In an another development, the party welcomed the government's decision to partially remove restrictions on air space for Pakistani flights saying that the decision indicated that India would take further measures to normalise relations If Gen. Musharraf's assurances were practised on the ground.

"If history is any indicator, Pakistan has never kept its promise, be it the Tashkent agreement, Simla accord or the Lahore declaration," she pointed out.

The government partially lifted the five-month-old air embargo on Pakistan by allowing its aircraft to overfly Indian air space.

Source : *Tribune News Service, June 10, 2002.*

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KALAM RIGHT CHOICE, SAY JAYA, NAIDU

Hyderabed: TDP Supremo and Andhra Pradesh Chief Minister N. Chandrababu Naidu, who played a leading role in the NDA zeroing in on eminent scientist A.P.J. Abdul Kalam as its presidential candidate, appealed to the Congress, the Left and other parties to support Dr. Kalam's candidature at this "crucial juncture".

Talking to reporters soon after his arrival from New Delhi, Mr. Naidu described Dr. Kalam as the "nation's pride" and the "best choice". Besides making an outstanding contribution in the field of Science and Technology, Dr. Kalam was patriotic, simple, humble, and a non-political personality, he said.

At a time when the country was faced with a war-like situation, the choice of Dr. Kalam would send the "right signals to the international community" as well as within the country, he added.

Chennai: Dravidar Kazhagam General Secretary K. Veeramani said "this will heal the wounds of minorities, who have been hurt by the violence in Gujarat and will enhance the country's prestige in the International community."

The AIADMK will extend its support to Dr. Kalam, Jayalalithaa said. "It is a matter of great pride and happiness for the AIADMK that he belongs to Tamil Nadu."

Patna: RJD President Laloo Prasad Yadav said Dr. Kalam was a "good choice" for the post of President but he was being "dumped" as a scientist by the NDA.

However, the RJD would go by the decision to be taken by the Opposition during the meeting likely to be held in New Delhi, Mr Laloo Yadav said.

***Source :** Tribune News Service, June 11, 2002.*

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NARAYANAN NOT CANDIDATE

President K.R. Narayanan tonight declared that he is not a candidate for coming presidential elections.

A terse statement issued by the Rashtrapati Bhavan tonight said there had been media reports suggesting that President Narayanan may be a candidate for the Presidential elections. This is to clarify that he is not a candidate.

Source : *Tribune News Service, June 11, 2002.*

CHANCES OF FAROOQ AS VP RECEDE

With the picking up of Mr A.P.J. Abdul Kalam for the post of the President of India by the BJP-led NDA, the chances of the Kashmir Chief Minister, Dr. Farooq Abdullah, getting elected as Vice-President have been sealed.

Though Dr. Abdullah was not the number one choice for the Vice-President's post for the NDA, his name had figured in the recent weeks. Sources said had there been unanimity over Mr. Krishna Kant's candidature for presidentship, Dr. Abdullah would have been a favourite choice for the NDA. This way the NDA could ease out Dr. Farooq from Jammu and Kashmir and get a chance to place the state under Governor's rule, two months before the Assembly poll.

It would not have been possible for Dr. Abdullah to emerge as a consensus candidate in case the dice had been cast in favour of Maharashtra Governor P.C. Alexander. It has been a practice that candidates from among minorities do not hold both the President's and Vice-President's seats.

During the past over two years, Dr. Abdullah has been making his feelings known in public that he wished to be either the President or Vice-President of the country as he wanted a respite from being the Chief Minister of the trouble-torn state of Jammu and Kashmir.

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Since his son Omar Abdullah is taking over as President of the NC within two weeks, the Chief Minister had planned to put the crown on his (Omar's) head. This plan may not fructify in case Dr. Kalam emerges as the consensus candidate for the post of President.

A section of the National Conference leaders have blamed the Congress for having blocked the entry of Dr. Abdullah into the Vice-President's lodge. These leaders said that had the Congress agreed to support Mr. Krishna Kant, it would have become easy for Dr. Abdullah to get elected as Vice-President.

They suspected that the Congress leaders possibly were under the impression that their party could do well in the next Assembly poll in Jammu and Kashmir provided Dr. Abdullah remained the Chief Minister. The NC leaders said that in case Dr. Abdullah failed to get elected as Vice-President it would be a boon for the National Conference because he still had the charisma to carry the voters with him.

Source : *Tribune News Service, June 11, 2002.*

PRESIDENTIAL POLL PROCESS SET IN MOTION

The process of electing a successor to President K.R. Narayanan, who will demit office on July 24, was set in motion with the Election Commission issuing a notification today.

According to the poll schedule issued by the commission, the last date for filing nominations will be June 25 and scrutiny will take place the following day. While the last date for the withdrawal of candidatures will be June 28, election, if necessary, will be held on July 15.

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The election will be held "in terms of Clause (1) of Article 62 of the Constitution.

Source : *Tribune News Service, June 11, 2002.*

ABDUL KALAM LIKELY TO BE PRESIDENT

The government's former scientific adviser A.P.J. Abdul Kalam is the ruling NDA's official candidate for Presidency. And going by the numbers following the support the TDP, the AIADMK and the BSP – which are not part of the alliance – have pledged for him, Kalam, appears headed for Rashtrapati Bhavan as its next resident.

The Congress has also indicated that it has no major reservations about Kalam. People's Front constituents – the Left and the Samajwadi Party – have exulted at the announcement of his nomination by Prime Minister Vajpayee.

That makes it certain that the man who played a key role in the country's missile and nuclear programme and was honoured with a Bharat Ratna would be elevated to the highest post of the Republic.

Kalam was a dark horse. His name was dropped but the Prime Minister during his meeting with Samajwadi Party chief Mulayam Singh Yadav, chiefly to break the Opposition's united and steadfast stand that the government agree to a consensual candidate. Yadav readily agreed to Kalam's candidature.

Kalam emerged frontrunner after Vajpayee met Congress chief Sonia Gandhi and she indicated she had no major objection to the proposal. A formal Congress decision is expected in a day or two. The party had earlier made it clear it would not accept the NDA's unilateral choice of Maharashtra Governor P.C. Alexander and kept up strident support for a second term for President K.R. Narayanan.

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When a confrontation and a contest appeared inevitable, the Prime Minister got TDP supremo chandrababu Naidu and Shiv Sena chief Bal Thackeray to back Kalam. While Vajpayee spoke to Naidu late Sunday night and suggested Kalam's name, Parliamentary Affairs Minister Pramod Mahajan was despatched to Mumabi to explain the situation to Alexander and also to get Thackeray's approval.

The formal announcement was made late Monday night following a series of meetings that Vajpayee had during the day with his party colleagues, the Opposition leaders and finally his NDA allies.

Having failed to evolve a consensus within its own ranks over the last few days, the NDA sought to put its house in order when it presented a united front while declaring Kalam's candidature.

The announcement was made jointly by NDA convener George Fernandes, Pramod Mahajan and Chief Ministers of Andhra Pradesh and Uttar Pradesh Chandrababu Naidu and Mayawati.

Source : *Times News Network, June 11, 2002.*

NAIDU PUTS KALAM ON ROAD TO RAISINA HILL

Andhra Pradesh Chief Minister and Telugu Desam president N. Chandrababu Naidu may once again prove to be the kingmaker. Naidu had realised that his advocacy of Krishna Kant as the presidential candidate was not getting adequate support from within the NDA and he floated the name of India's "missile man" Dr. Abdul Kalam as a consensus candidate.

On Sunday morning, he telephoned the NDA convener and Defence Minister George Fernandes and urged him to consider Kalam for the country's top post. George apparently

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did some probing and found that the name was acceptable to NDA constituents and conveyed the same to Naidu.

TDP circles told the *Hindustan Times that* boosted by George's feedback, Naidu sounded the Prime Minister on Sunday morning. He reportedly said to Vajpayee that at this juncture, when Gujarat killings had given a bad name to country's secular image, the appointment of Kalam would send a right message to the world. He also said the selection of the former defence advisor will blunt Pakistan's shrill anti-India campaign.

Naidu called up Kalam at Chennai and secured his consent before formally proposing the name to PM. Naidu reportedly told senior party leaders that the choice of Kalam is the best under the given circumstances. He informed that Kalam spent most part of his professional life at the DRDL, Hyderabad, and thus he was as much a Telugu *bidda* (son).

Parties cutting across ideology have welcomed Kalam's selection. "It is a great day for India," said Sarojini Pulla Reddy, CWC member and veteran Congress leader. "It is a wonderful decision and a whack in the face of people who call India's secular ethos a sham," said a senior TDP minister.

Source : *The Hindustan Times, June 11, 2002.*

MISSILE MAN RISES FROM HUMBLE BASE

By Naming A.P.J. Abdul Kalam its candidate for President, the NDA has fired a missile that the great scientist himself would have been proud of forceful, effective and more likely to hit home than anything else.

There is little that any one can find to fault the credentials of Avul Pakir Jainulabdeen Abdul Kalam, father of India's missile programme.

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He is brilliant and non-controversial, a man who has risen to be the greatest in his field without the use of politics, favours and connections—through sheer hard work, talent and perseverance. In the present context, he is to many, a contemporary hero.

Born at Dhanushkodi, Tamil Nadu on October 15, 1931, A.P.J. Abdul Kalam did a B.Sc. from St. Joseph's College, Tiruchirapalli–the first graduate in his family — and then studied aeronautical engineering at Madras Institute of Technology.

Under Kalam's stewardship, India's missile development programme took rapid strides, culminating in the successful launches of the ***Trishul, Prithvi, agni, Nag*** and ***Akash*** missiles. The crowning glory came with the Pokhran II nuclear tests. He was conferred the nation's highest civilian honour, the Bharat Ratna, in 1997. He had been honoured with the Padma Vibhushan in 1990 and the Padma Bhushan in 1981.

Kalam quotes with equal ease from the *Koran* and the *Bhagvad Gita*, plays the veena, writes poetry in tamil and admires Subrahmanya Bharti. He never married.

Recently, Kalam was refused professorship at Bangalore's Indian Institute of Science for not having a Ph.D. He went to Anna University - where he spun out three unique projects: a brain research centre for mentally challenged kids, a way to format digitally knowledge preserved in palm leaves and a cochlear implant for deaf children.

Kalam's fans cannot be faulted for believing that should he make it to Rashtrapati Bhavan, the country would have repaid his unique services with a job he truly deserves.

Source : *The Hindustan Times, June 11, 2002.*

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'I'M VERY HAPPY WITH NOMINATION'

Eminent Scientist A.P.J. Abdul Kalam, NDA's nominee for the post of President, on Monday night expressed happiness over his choice for the top post.

Kalam, who was interacting with professors of the Anna University where he is now staying, sent word through Dr. Radhakrishnan, his coordinating officer, that he was 'very happy' about the choice. However, he said he would meet the press after everything was finalised.

Efforts to contact Dr. Kalam over phone proved futile.

Radhakrishnan told media persons on the university premises that Dr. Kalam had received a call from New Delhi on Sunday night conveying the news of his nomination to the post.

Source : *The Hindustan Times, June 11, 2002.*

SENA BACKS KALAM'S CANDIDATURE

Shiv Sena, a key ally of the ruling NDA at the Centre, hailed the choice of renowned technocrat A.P.J. Abdul Kalam as the presidential nominee.

Describing Kalam as a 'different man', Sena supreme Bal Thackeray told reporters that "why should we oppose him . . . He has given the country all these arms and ammunition".

Thackeray praised Kalam for his reply that he would not consult an astrologer for filing his nomination for the President's post as "earth revolves around the Sun and it is an astronomical fact and not an astrological phenomenon.

Source : *Press Trust of India, June 12, 2002.*

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KERALA CM A.K. ANTONY FAVOURS KALAM'S CANDIDATURE

Kerala Chief Minister and Congress Working Committee member A.K. Antony informed Congress president Sonia Gandhi that he favoured the candidature of noted technocrat A.P.J. Abdul Kalam for the presidential poll.

According to Congress sources, Antony spoke to Sonia Gandhi over telephone as he was not able to attend the crucial CWC meeting in New Delhi to decide on the party's stand on the issue.

The Indian Union Muslim League (IUML), the second largest partner in the Congress-led

United Democratic Front government in Kerala, has already welcomed Kalam's candidature.

Source : *Press Trust of India, June 12, 2002.*

KALAM ACCEPTABLE AS SCIENTIST, BUT NOT AS PRESIDENT: BASU

Veteran CPI-M leader and People's Front president Jyoti Basu has opposed the candidature of scientist A.P.J. Abdul Kalam for the presidential poll.

"Kalam is a world-famous scientist. It is better for him to be where he is," the octogenarian Marxist leader said in Kolkata.

Stating that his party was talking to other opposition parties on this issue, Basu said that the CPI-M's view has been conveyed to the Congress.

The recently formed non-Congress and non-BJP alliance, the People's Front, faced its first major crisis today as it split over the issue of the presidential candidate with the Samajwadi Party declaring support for noted scientist A.P.J. Abdul Kalam and the Left parties expressing reservation over his candidature.

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The NDA's surprise choice of Dr. Kalam as its nominee for the post of President has thrown the opposition into disarray with the Front comprising of the Left parties and Samajwadi Party getting divided and the Congress adopting a wait and watch approach over the issue.

The Congress Working Committee has authorised the party President Sonia Gandhi to decide on the issue in consultation with other opposition parties.

After two rounds of discussion, the PF meeting could not arrive at a consensus on the candidature of Dr. Kalam. Serious differences have cropped up as the Samajwadi Party, which had propped up Dr. Kalam for the country's top post, remained firm on backing him. Mr. Yadav had mentioned the name of Dr. Kalam to Prime Minister Atal Behari Vajpayee as his choice for the country's next President when the two had met last month.

The Left parties would meet tomorrow to announce their candidate for the post of President.

After the meeting, Mr. Yadav said: "Differences have cropped up between People's Front leaders on the issue. There is no unanimity in the Front on the issue."

"Dr. Kalam is a very good choice for President's office. He is an able scientist, scholar and eminent person of great fame. He is not the candidate of the BJP, the RSS, the Shiv Sena, the Congress or the Samajwadi Party," Mr Yadav said.

Coming out of the second round meeting of the Front, Mr. Yadav admitted to newspersons here that the Front had failed to reach a consensus. "We have been saying that Dr. Kalam is a good candidate for President's post and we will support him."

Mr. Yadav, however, said the differences on Dr. Kalam's candidature would not have any effect on the morcha and

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it would "remain intact and our fight against communalism will continue".

The Front comprises of the Left parties, the CPI, the CPM, the Forward Bloc and the Revolutionary Socialist Party, the Samajwadi Party and the Janata Dal (S).

CPI General Secretary A.B. Bardhan said the view of Samajwadi Party was different from the rest of People's Front constituents.

Asked whether the Front had broken up, Mr. Bardhan said, "We will tell you everything tomorrow."

Earlier, after the meeting of the People's Front held at the residence of CPM leader Harkishen Singh Surjeet, Mr. Bardhan had told newspersons "Mr K.R. Narayanan is still our candidate", while former Prime Minister and JD (Secular) leader H.D. Deve Gowda said the Front could not change its nominee like the BJP "every three hours".

As the meeting of the Front was in progress, senior Congress leader Manmohan Singh drove to Mr. Surjeet's residence and left after a short discussion on the Presidential nominee.

Later, Mr. Surjeet had a meeting with Congress President Sonia Gandhi at 10 Janpath which is her residence.

The Congress has also maintained that there was no question of its dumping Mr. Narayanan in favour of Dr. Kalam and it would firm up its decision only after the Incumbent President indicated his mind.

Meanwhile, the Indian Union Muslim League (IUML) extended a warm welcome to the candidature of Dr. Kalam for the post of President and said the party favoured his unanimous election to the highest post of the land.

IUML supreme and Kerala State Unit President Syed Mohammad Ali Shihab Thangal in a statement said the party fully supported the NDA move to field Dr. Kalam. He should

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be the consensus candidate and any election to the post should be avoided, Mr. Thangal added.

In Chennal, Tamil Nadu State IUML President K.M. Kader Mohideen congratulated Prime Minister A.B. Vajpayee for selecting missile scientist as the NDA's Presidential candidate.

In a letter to the Prime Minister, Mr. Mohideen said by choosing a scientist for the top post, the constitutional provision of promoting a scientific temper in the country was exemplarily fulfilled.

Quoting Swami Vivekananda, he said: "The future glory of India lies in the blending of the vedantic brain with the Islamic body. Let the brain and the body of India unite in the choice of the President of India."

Source : *Press Trust of India, June 12, 2002.*

NARAYANAN SAYS NO, BUT CONTEST ON CARDS

SP for Kalam; Left to field candidate

President K.R. Narayanan on Tuesday announced he would not contest for a second term. But hopes of a consensus on A.P.J. Abdul Kalam, the NDA presidential nominee, collapsed with the Left parties saying they would put up a candidate.

A Rashtrapati Bhawan communique said though media reports had suggested the President could be a candidate for the presidential elections, he actually was not.

In contrast to the Left's position, the Congress deferred a decision till Wednesday, when its working committee will meet to take stock of the "resulting situation", part spokesman Jaipal Reddy announced late on Tuesday night. He refused to say whether the party, like the Left, would reject Kalam's candidature.

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"We are in contact with the Left parties, but have not taken any view on the matter," Reddy said. His comments came after a 90-minute meeting between the President and the Congress's Manmohan Singh and K. Natwar Singh, at which Narayanan conveyed his decision. They were joined by the CPI (M)'s Sitaram Yechury.

But there are two views in the Congress. One group wants to go along with Kalam's candidature. Another group is chary of doing so given the RSS and VHP's support for Kalam and the long term implications of backing Kalam on the party's relations with the Left.

After a People's Front (PF) meeting, CPI general secretary A.B. Bardhan said, "Kalam is a NDA candidate whom we cannot support in the prevailing situation." But after the same meeting, Samajwadi Party (SP) chief Mulayam Singh Yadav said his party would support Kalam's candidature.

The Left's determination not to allow Kalam's candidature to go unchallenged has thus split the PF. Mulayam Singh justified his support for Kalam, after two PF meetings, by saying his party had first suggested Kalam for president at a meeting with Prime Minister A.B. Vajpayee before the latter's Almaty visit.

But Mulayam Singh sought to play down the disagreement. "We will do nothing from our side to disturb the Front," he told reporters outside CPI (M) general secretary H.S. Surjeet's house where the PF meetings were held.

After Mulayam Singh left with party colleague Amar Singh, Left leaders refused to comment on whether he would continue as PF convener. But he is unlikely to be invited to a meeting on Wednesday that will be attended by the other PF constituents.

Left leaders were, however, in contact with the Congress through the day.

Source : *The Hindustan Times, June 12, 2002.*

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KALAM : BJP PREENS, ALLIES CLAIM CREDIT

The BJP's allies on Tuesday claimed credit for getting the NDA to back A.P.J. Abdul Kalam for President. The BJP itself appeared thrilled on being able to split the opposition on the candidature. The RSS's approval of Kalam came as a bonus for the party.

BJP general secretary Maya Singh asked the opposition not to delay accepting Kalam and to ensure a unanimous election for him. No country had appointed a scientist as its head of state, she said, and no part could have an objection to his name.

TDP boss Chandrababu Naidu and Trinamool chief Mamata Banerjee said they were happy they had got the BJP to accept Kalam.

Mamata's aides said she had been backing Kalam's candidature from the beginning and that she had been in touch with Naidu to persuade the BJP to accept his name. Naidu described Kalam as "the best choice" - a scientist who had done so much for the country, was patriotic, and symbolised the nation's resolve.

The BSP's Mayawati claimed Kalam as one of her own. "He represents classes which our party considers a part of the class to which Dalits belong," she said.

Source : *The Hindustan Times, June 12, 2002.*

CONG. DEFERS DECISION ON KALAM

The Congress has postponed a decision on whether to back NDA presidential nominee A.P.J. Abdul Kalam or join the Left in opposing his candiature.

The CWC, which met on Wednesday morning, decided to carry out wider consultations after being briefed by

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Manmohan Singh and K. Natwar Singh, who have been liaising with the Left and other political groups. Another CWC session could be held "in a day or two" Congress spokesman Jaipal Reddy said amid reports that the party would finalise its stand on Thursday.

The Congress seems to be caught between a rock and a hard place: supporting or rejecting Kalam's candidature could mean choosing between minority and middle-class support and the Left's support in the next general elections.

Congress leaders say though the Left would figure in the process of arriving at a decision, their party would be guided by its role in national politics and 'Congress philosophy'. This could make it hard for the Congress to subvert a consensus by backing a candidate against Kalam, though the party is not rushing to support him after the BJP changed nominees several times.

The Left, meanwhile, had started looking for a candidate to contest against Kalam, after formally announcing the collapse of the People's Front. "After giving the NDA four days to come up with a candidate, you should give us at least two days," CPI general secretary A.B. Bardhan told reporters, emphasizing the need for consultations within the Left and with the Congress.

Source : *The Hindustan Times, June 13, 2002.*

CONG. TORN BETWEEN KALAM AND LEFT

The People's Front has already split and dissipated over A.P.J. Abdul Kalam's projection as the next President. But will he NDA-sponsored candidature, baked with unrestrained glee by the Samajwadi Party, also take a toll of the Congress' carefully nurtured ties with the Left ?

The question has been troubling the party since the formal announcement last Monday of Kalam's nomination. It's chary of spoiling ties with the Left. But it also recognizes

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the danger of disregarding the overwhelming popular response to the rocked-scientists' proposed elevation.

At stake, in fact, is the Congress' image among the minorities and the middle-classes, who have always engaged in aggressive nationalism when tensions are palpable on Indo-pak borders. Not surprising, therefore, that the principal Opposition has chosen to measure its moves, especially when it runs the risk of dragging the president's office in an eminent avoidable controversy with no hopes of wining the battle.

The futility of a contest has been driven home by the alacrity with which Mulayam Singh distanced himself from President K.R. Narayanan in defence of Kalam, his original choice for the Rashtrapati Bhawan. The Congress' main concern now is to strike a balance between its political compulsions as a massbased organisation without losing the tactical advantage of keeping company with the cadre-oriented, ideologically inflexible Left.

When she was first informed about Kalam's candidature on Monday morning, Congress president Sonia Gandhi had reportedly said that she knew the scientist and had, on occasions, even interacted with him. But she was worried that his projection could be a BJP-NDA ploy to divide the Opposition.

The initial reaction of other Congress leaders was identical – the doubts mostly being about the ruling combine's intentions and not Kalam's personal integrity and high stature.

So, in their internal discussions, Congress leaders have debates the issue without any personal references to the NDA nominee. While they share the Left's apprehensions of Kalam not being cut out for the highest office, given his non-political background, they are unable to come to terms with a situation where they maybe seen as opposing a national hero.

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When the Congress finally makes its stand known, it might choose to be more expedient than the Left parties, which have rarely let a presidential election go uncontested since Independence.

Source : *The Hindustan Times, June 13, 2002.*

NDA DECISION WILL AFFECT J & K POLITICS

The NDA's decision to fielding noted scientist A.P.J. Abdul Kalam as its candidate for President's post will have a direct bearing on J&K politics.

The ruling alliance's decision has blocked all chances of J & K Chief Minister Farooq Abdullah becoming President or Vice-President. It was hoped that the NDA's nomination would come his way on the assumption that a Kashmiri Muslim would be fielded this time to demonstrate to the world that how much is Kashmir at the "core of the Indian nationhood" -- a favourite phrase of the national leadership.

Now coming as it does, this decision has upset the political equations of the ruling party as well as of the Opposition in the state. The Opposition has been hoping that with Farooq shifting to Raisina Hill it would make their task of taking on the NC easy.

"If Farooq continues to stay in the state politics, it would mean lot many difficulties for us," a senior opposition leader in Jammu said on condition of anonymity. Farooq, he admitted, had the oratory powers and takes the crowds "under his spell". "We will have to face him again," he said. But this decision has also created difficulties for the ruling party.

Now, Farooq Abdullah has to contend with a difficult choice whether to hand over the power to this son Omar Abdullah and retire from politics or continue in policies and leave his son where he is. Had he been selected for one of

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the highest offices in the country, he could have easily handed over both the National Conference presidentship and chief ministership to his son.

"Then, it would have been a very easy thing for Farooq Abdullah to do," observed political commentator Tahir Mohi-ud-din, who also edits a popular Urdu news paper *Chattan*.

But the problem is that Omar cannot be where he is unless he chooses not to be come the party president on June 23. That possibility is remote. The NC has already started making arrangements for the massive convention in which junior Abdullah would be elected as the party head.

Source : *The Hindustan Times, June 13, 2002.*

CONG. BACKS KALAM, LEFT IN THE LURCH

The Congress on Thursday threw its weight behind A.P.J. Abdul Kalam, creating a broad consensus over the next President of India.

"The Congress party, after extensive consultations, has decided to support the candidature of Dr. Abdul Kalam for the high office of the Rashtrapati of India," party spokesman Jaipal Reddy said.

Senior Congressmen Manmohan Singh and K. Natwar Singh conveyed the party's decision to CPI (M) general secretary H.S. Surjeet in the afternoon. The Left has now been completely isolated on the issue. It insisted it would put up a candidate against Kalam, however.

Officially, the Congress gave a one-line reason for backing Kalam. "Having due regard to the totality of circumstances, we have favoured the candidature of Kalam," Reddy said.

The decision had been unanimous, the spokesperson said. But there were reports of stray voices spoiling for a fight. An overwhelming majority of Congress leaders favoured a pro-consensus, pro-Kalam line, though.

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Several considerations were factored in.

Popular sentiment countrywide is in Kalam's favour, most Congressmen thought. And his lack of political experience apart, there is really no substantive reasons why the part should have opposed him. Not backing him might, in fact, have angered both Muslims and the middle class proponents of aggressive nationalism.

Despite being the NDA's nominee, Kalam is not a BJP man. He is apolitical, and his greatest achievements have come under non-BJP regimes. It was the UF government that had conferred the Bharat Ratna upon him.

Most importantly, even if the Congress had joined hands with the Left, their numbers wouldn't have been enough to keep Kalam away from Rashtrapati Bhavan. Had Kalam been elected under such conditions, he would have been obliged to the BJP.

Besides, Kalam was not the BJP-NDA's first choice. Congress leaders pooh-poohed fears that the BJP might use Kalam's Muslim identity to counter the Opposition's anti-communal campaign." No one will be convinced by it," Reddy said.

Congressman expressed confidence that the "tactical" decision would not upset their "ideologically oriented" relations with the Left.

On his part, Kalam thanked everybody who had supported him, including Congress chief Sonia Gandhi. "I am really overwhelmed," he said.

On the controversy over his nomination, he recalled a "famous Indian thought...": "Whatever has happened has happened for the good, whatever is happening is happening for the good, whatever will happen will happen for the good."

Source : *The Hindustan Times, June 14, 2002.*

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DEFEAT CERTAIN, BUT LEFT PUTS UP BRAVE FACE

The People's Front has split and the Congress has thrown in its lot with A.P.J. Abdul Kalam's candidature as the next nominee for Rashtrapati Bhavan. But the Left parties continued to put up a brave front on Thursday, saying they would contest the election on July 15.

After the double blow — from the Samajwadi Party and the Congress—Left leaders said they would hold a meeting at CPI (M) general secretary H.S. Surjeet's residence on Friday and decide their next move. They said they would put up a candidate and contest "even if it has to be a token opposition".

"We will have to oppose the NDA political. The result is a foregone conclusion. But we will contest and put up our own candidate," a Left leader said.

Now that the Congress has made its stand clear, Left leaders believe Laloo Yadav's RJD will follow suit and support Kalam.

Soon after the news of the Congress' endorsement of Kalam, A.B. Bardhan and D. Raja of the CPI along with CPI (M) Politburo members Sitaram Yechury and Prakash Karat met Surjeet. Yechury reiterated that the Left will contest the elections and may announce its candidate on Friday.

In Kolkata, CPI (M) politburo member and former Chief Minister Jyoti Basu expressed unhappiness over Congress' decision. "Congress being the main opposition party has done a very wrong thing," he told the *Hindustan Times.*

The Left, which had on Wednesday discussed - though not finalised - the names of former Chief Justice A.H. Ahmadi and former TN Governor M. Fathima Beevi, feels that without going in for consensus the NDA Government proposed the name of Kalam.

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However, there is still confusion on whether Ahmadi was sounded out before his name was noted.

Meanwhile, Fathima Beevi has denied knowledge of her name being considered for the top post. "It is news to me," she told the *Hindustan Times.*

Source : *The Hindustan Times, June 14, 2002.*

STATES STAKE CLAIM TO KALAM

The Nation, says A.P.J. Abdul Kalam, is greater than the individual. But when the individual is likely India's next President, other individuals fall over each other to claim him for themselves, and the nation be damned.

Tamil Nadu CM Jayalalitha has been "doubly happy" to support Kalam because he was born in her state (Rameswaram).

Andhra CM Chandrababu Naidu – the man who claimed credit for forcing Kalam's candidature down BJP's throat – says the scientist is a "Telugu bidda" (brother) as he stayed for long in Hyderabad.

And after Kerala CM A.K. Antony jumped the party gun to announce support for Kalam, Keralites have been rediscovering nuggets about his association with the state, in particular his work at the Thumba rocket launching station near Thiruvananthapuram.

The Malayalam media was in fact, first off the block, calling Kalam Kerala's gift to India. The Tamil press caught on, speaking glowingly of the Missile Man's love for Rameswaram.

People at Kalam's home the so-called "House of Kalam" on Rameswaram's Mosque Street – and in its neighbourhood have been basking in the reflected glory of their prodigal son.

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Eighty-five-year-old A.P.J. Muhammad Muthu Meeralabha, the brother of the presidential nominee, has been receiving a constant stream of visitors.

Meeralabha appears a bit sad that Kalam never married—though it had "nearly happened" when he was 32.

"The bride was a teacher from the same community and everything was fixed. But one of out brothers fell ill and he used it as an excuse to slip out."

Source : *The Hindustan Times, June 14, 2002.*

LEFT FIELDS INA VETERAN SEHGAL

To counter A.P.J. Abdul Kalam's image as a nationalist and a patriot, the Left parties on Friday put up Netaji's Indian National Army (INA) veteran, 88-year-old Captain Lakshmi Sehgal as their presidential candidate.

Announcing "comrade" Sehgal's name, CPM general secretary Harkishen Singh Surjeet said the contest (between Kalam and Sehgal) would be 'unequal', but "at least we will be able to teach a lesson" to not only the NDA but all those who deserted us.

He was hinting at the Samajwadi Party and the Congress, which declared their support to the NDA nominee.

Revolutionary Socialist Party (RSP) leader? Abani Roy said that the Left parties were 'united' and their choice of Sehgal was unanimous. Roy said no other names were discussed in the meeting of the Left Front after Sehgal's name was suggested by the CPM.

Reiterating that the Left and former Prime Minister H.D. Deve Gowda's Janata Dal (S) "stood united", Surjeet said Sehgal's name was discussed with Gowda and V.P. Singh, and both had "lent their full support".

Spelling out reasons for choosing Sehgal, CPI General Secretary A.B. Bardhan said, "She is a political being who

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has been part of the trade union movement and symbolises the best traditions of the Indian freedom movement."

Sehgal is the first woman to be fielded by any party ever for presidential polls. She was also the first woman Cabinet minister in the Azad Hind Government in-exile and lead the Rani Jhansi Regiment of INA.

Sehgal, who lives in Kanpur and continues to practise medicine besides being involved with the welfare of slums there, has agreed to be the Left's nominee. Taking a dig at Vajpayee, Surjeet said, 'After Pokhran tests in 1998, the PM's slogan was *Jai Jawan, Jai Kisan* and *Jai Vigyan*. The country requires scientists but is now being deprived of the services of Kalam".

Source : *The Hindustan Times, June 15, 2002.*

FROM BATTLEFIELD OF BURMA TO RACE FOR RAISINA HILL

Lakshmi Sehgal the Left's answer to missile man A.P.J. Abdul Kalam has given her consent to fight for the nation's highest office. When CPM general secretary Harkishen Singh Surjeet informed her of the decision late on Thursday night, the Joan of Arc of yesteryears was in disbelief. For few minutes, Sehgal couldn't believe her ears. The feeling was similar to when she was offered to lead the Rani of Jhansi regiment by Netaji in 1943.

"I was quite surprised after Left Front leaders, Surjeet and Bardhan, offered me the nomination for the presidential post," she said. "The offer was unexpected, but I have accepted it," she adds.

Flooded with visitors, phone call and e-mails, Sehgal and her daughter, Subhashini Ali, set off to New Delhi later on Friday to hold talks with Left leaders. She told waiting reporters: "I am determined to contest this election. Its an opportunity."

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Daughter of brilliant lawyer Subharam Swaminadhan and first woman president of Bharat Scout and Guides, Sehgal was born in 1914. Brought up in cosmopolitan milieu, she was inspired to join the freedom struggle by, Sarojini Naidu's sibling Suhasini Naidu, an accused in the Meerut conspiracy case.

Suhasini, who spent months with Swaminadhan, evading the British introduced her to communism. As a result, Sehgal opted for medicine. In 1936, she married B.K.N. Rao, but the marriage lasted for six months. In 1938, she got her medical degree from Madras Medical College. Two years later she left for Singapore.

Since Singapore was under Japanese control, it had become a major centre for the Indian freedom struggle. Here, she came in contact with people owing allegiance to Netaji. She formally joined the Indian National Army in 1942 and led a highly disciplined women regiment, which actually began with strength of just 15 women.

Her heroics in and off the battlefield made her famous and she was held by the British in Burma, Subsequently, she was deported to India in 1946. She married another INA hero. Col. P.K. Sehgal, in Lahore and settled down in Kanpur after her husband was offered a job in a mill here. Here, she made all attempts to keep the INA alive, which by then had become an apolitical outfit, and dedicated herself towards charity work.

Driven by the plight of the labour class, she joined the CPM. Hardcore communist at heart, Sehgal of late floated the All-India Progressive Women Association. Now even at 88, she is tirelessly dedicated to poor and needy.

Source : *The Hindustan Times, June 15, 2002.*

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MISSILE MAN WHO WILL BE PRESIDENT

Two weeks ago, when Prime Minister Vajpayee floated the name of A.P.J. Abdul Kalam for the position of the foremost public servant of the land, he knew he had a winning strategy.

The rival camp's key player Mulayam Singh Yadav swallowed it hook, line and sinker. After all it was Mulayam who as defence minister in 1997 had pushed for a Bharat Ratna for India's premier missile engineer. Vajpayee's aim was to get a BJP nominee elected to the highest office in the land as well as to torpedo the People's Front. He had achieved both ends.

It is not that Mulayam is a great believer in science and technology or in Kalam's achievements as a missile engineer. He wanted to cash in on Kalam's Muslim background. By this time Kalam was already an iconic personality whose inspirational statements and frugal life-style earned him a devoted following, especially among the role-model seeking youth in the country.

It is a different matter that the Agni and Prithvi are merely a reinvention of the wheel, that missiles have been around since World War II and that Akash and Trishul surface-to-air missiles and the Nag anti-tank missile are yet to be fielded despite two decades of effort.

Besides being the head of the Defence Research and Development Organisation (DRDO) when Pokhran II was conducted, Kalam had little to do with the nuts and bolts of the nuclear weapons programme as such.

What makes Kalam attractive to the BJP, SP and Telegu Desam is his formal religion affiliation as a Muslim. His muscular nationalism manifested in one-liners—'Strength respects strength'—goes well with Sangh Parivar ethos. What makes him unbeatable for them is that he is a Muslim who exudes a rishi-like personality. He is a bachelor, who

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has for years worked out of a single room wherever he has stayed. He is equally comfortable reciting the verses from the *Bhagwad Gita* as the *Holy Quran* and playing the rudra veena.

To cap it all, he is a poet and a fan of Subramania Bharti.

In view of the great store he lays on the virtue of modesty, he could well be known not so much as the "first citizen" but as the "premier servant" of the people of India.

But Kalam's elevation has several weaknesses. First, is the signal that the world gets by the appointment of a missile engineer to the position of President of the republic. Second, while non-political luminaries bring great credibility and freshness to the office of the President, Kalam is handicapped by his defence scientist background which makes him naturally respectful towards the governments of the day.

Having lived a life that required being shielded from politics, Kalam will not find it easy to deal with the political ethos of the era of coalitions.

But Kalam's personality, his graying locks and his Gandhian 'simple living and high thinking' formula conceal the mind of a shrewd player who has been spectacularly successful in bureaucratic politics of the Ministry of Defence and shown a knack for coming up a winner in the corridors of power in New Delhi.

***Source** : The Times of India, June 15, 2002.*

HEAD OF STATE, WITHOUT THE TRIMMINGS

On July 15, A.P.J. Abdul Kalam may make it to Rashtrapati Bhawan without a hair out of place.

The scientist has shot down suggestions from friends that he lop off his rock star locks to look more, unpresidential, "People are used to seeing me this way," he has told them.

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Kalam is proud of his mane, said a scientist at the Defence Research Development Laboratory (DRDL). "He preens himself before the mirror before going out; and often, pulls out the comb he carries in his pocket. In the middle of work, he suddenly gets up saying he'd be back in an hour. He returns with his hair trimmed."

No one at either Chennai's Anna University or a DRDL knows where the scientist gets his hair pruned, though.

Nor has anyone the foggiest why or when Kalam began to grow his thatch. A former Hyderabad colleague hazarded a guess: "He might have been influenced by the *sadhus* he saw as a child at Rameswaram and during his visit to Rishikesh."

Sometimes, family elders would scold him for the mess he carried on his head, but Kalam simply laughed it off, said his nephew Jainulabuddin.

But the hair, parted down the middle withlocks hanging on either side, had been a hit with young scientists at Vikram Sarabhai Space Centre where Kalam spent 20 years.

But the mane may not be the only part of his get-up to rock the audience at his swearing-in.

When colleagues told him that formal wear was a must for the occasion, Kalam happily informed them that he has two sets of Western suits, one of which he had worn while receiving the Bharat Ratna in 1997.

"Some of us thought of suggesting the *achkan*," a friend said. "But then he might then have wanted to wear the *dhoti* and *jubba*."

It could be worse, though. "I have seen him wearing sandals with a three-piece suit," recalls Parameswaram Nair, a lodge-keeper at Thiruvananthapuram.

At the swearing-in, that would indeed be a hair-raising experience. *(with inputs from Ashok Das and Ramesh Babu).*

Source : *The Hindustan Times, June 16, 2002.*

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KALAM TO MEET PM ON MONDAY

The July 15 presidential poll process is set to commence formally on Monday when the NDA's nominees for the nation's top office A.P.J. Abdul Kalam arrives here to meet with ruling coalition leaders, including the PM.

His nomination papers are expected to be filed either the same day or on Tuesday. The broad contours of his campaign would be finalised later.

Kalam's preliminary schedule is understood to have been discussed by the MoS in the PMO, Vijay Goel, with Kalam at Chennai on Friday. The two met for about 40 minutes at the Anna University Guest House.

According to Goel, Kalam has expressed a desire to carry on with his scientific mission even as a resident of Rashtrapati Bhawan.

Source : *The Hindustan Times, June 16, 2002.*

QUEUE FOR RAISINA HILL

The Fall in the standard of politicians and of people in other walks of life is apparently beginning of affect the choices for the Rashtrapati Bhawan as well. Some of the names that have been mentioned for the post of the president (and vice-president) reflect the Hindutva camp's wish to keep the *bhagwa dhwaj* of the RSS flying even when the BJP is not in power at the centre. But more of that later. For the present, it can be said that even the current incumbent was not really an ideal candidate. Nor is his likely successor, A.P.J. Abdul Kalam.

To start with K.R. Narayanan, if he was not a favourite of the present government, it was because of his supposed activism. For once, however, the BJP was right. When Narayanan assumed office, he made it clear that he wouldn't be a quiescent president. However, there is no provision for

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an active president in the Constitution. Under it, the president, like the British monarch, is no more than a figurehead.

He can have opinions of his own, of course, about, for instance, the undesirability of a superpower acting like the headman of a global village. He can express it in a private conversation. But he shouldn't say it at an official banquet if the government does not share this view. In other words, the president should only read out from a text prepared by the government.

There is little doubt that Narayanan did not abide by such restrictions. If some of his 'activist' speeches, as about tampering with the Constitution, were received with approval, it is because the government's motive was suspect and a presidential rap on the knuckles was thought to be well deserved. But it will obviously not be a happy situation if the president and the government are often seen to disagree on crucial issues.

There were, of course, far more serious disagreements between Rajendra Prasad and Nehru. But Indian democracy was in a formative stage then and the respective spheres of authority in a parliamentary system had not yet been delineated or even understood by all. In fact, it took a threat or resignation from Nehru for Rajendra Prasad to pipe down. Fifty years later, a recurrence of such incidents will be extremely unfortunate.

No less unfortunate are the sectarian considerations which still influence the choice of a president. In Narayanan's case, his dalit background clinched his nomination five years ago although his other qualifications for the position are undeniable. But even today it is the dalit factor which was again mentioned in the context of giving him a second term.

Similarly, the name of Maharashtra Governor P.C. Alexander was floated primarily because he is a Christian. There might have been other, less wholesome, reasons as

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well, including the BJP's calculation that Sonia Gandhi, a Christian, might find it a little more difficult to become prime minister if there was a Christian president. Besides, the BJP probably also believed that his nomination would partly erase its anti-minority image.

But the very fact that considerations based on caste and community can play such an important part in the choice of a president in the 21st century is not a matter of pride. If there was any reason to oppose Alexander's candidature, it could only be the suspicion that he was a closet saffronite, a surmise confirmed by the support extended to him by Bal Thackeray.

Another name advanced on sectarian grounds in that of Abdul Kalam, the author of Pokhran II. But it has to be remembered that however thrilled Kalam may have been with his big bang, it made a mess of India's finely crafted nuclear policy which had stood the test of time for a quarter of a century. It was based, like Israel's, on the theory of nuclear ambiguity which kept the world guessing about the country's actual prowess. At the same time, India avoided the opprobrium of not subscribing to the non-proliferation treaty.

The BJP opted to change this policy to boost its own image and Kalam happily went along. But in the process, India lost its huge conventional superiority over Pakistan, the result of which we faced immediately in Kargil. That such nuances were missed by Kalam will be evident from a curious statement that he made about India's acquisition of intercontinental ballistic missiles.

According to him, India had "all technologies and industrial complexes" for an ICBM, but "it would require a strong, highly-willed nation" to decide on building the missiles. By adopting this simple-minded macho attitude, Kalam relegated virtually all the world, except the Big Five, into the category of weakwilled nations. But is isn't ICBMs alone

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which make a country 'strong'. Vietnam doesn't boast of these toys, but it nevertheless worsted three countries — France, the US and China — at least two of which had Kalam's favourite nuclear-tipped weapon in their arsenal.

Besides, the nuclear question has exercised the minds of scientists more renowned than Kalam and they have all been concerned about their negative impact. Einstein said that "we.... should not slacken our efforts to make the nations.... aware of the unspeakable disaster they are certain to provoke .... " In *The Neutron and the Bomb,* a biography of Sir James Chadwick, the author notes how the discoverer of neutron regarded the bomb as a "menace to civilization".

Unless Kalam is playing to the BJP gallery or lives only in the closed world of his laboratory, it is difficult to understand why he holds such strange views. It will be a mistake, of course, to regard him as a more sophisticated Sikandar Bakht. The BJP may yet rue its choice. The satisfaction which the VHP has drawn from his being a *Rambhakt*, a vegetarian and a bachelor may be short-lived. But he remains a loose cannon.

The name of another player to the BJP gallery — L.M. Singhvi — has also been mentioned. His claim to fame is that he teamed up with Murli Manohar Joshi's *kar sevaks* in the academic field to support the weird thesis of excluding all controversial references to well-known figures from history textbooks. According to Singhvi, hurting the feelings of any community was "unconstitutional" (will he call for the arrest of Ashok Singhal?) and, therefore, he was in favour of deleting those portions from textbooks where 'a deliberate attempt has been made to hurt the feelings of others".

If Singhvi was born in medieval times (where the Sangh parivar still seems to live), he would have sided with the prosecutors of Galileo, who had hurt the feelings of the clerics by disproving that earth was not the centre of the universe. In the Twenties of last century, Singhvi would have

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opposed the teaching of Darwin's theory of evolution in the American bible belt since it negated the "Divine creation of man as taught in the Bible" (to quote a judicial verdict of the time) and thereby hurt the sentiments of believers.

Then, there are the dyed-in-the-wool saffronites like Bhairon Singh Shekhawat, the other moderate in the BJP. But, as his fellow moderate Atal Bihari Vajpayee's Goa speech showed, there is no such species in the Sangh parivar. In essence, they are all Narendra Modis in different guises. Their elevation to positions of authority is fraught with considerable danger, as Modi's tenure in Gujarat has shown.

Source : *The Hindustan Times, June 17, 2002.*

BJP, CONG, SP TO FILE PAPERS FOR KALAM

A.P.J. Abdul Kalam will file his nomination papers at 11.30 a.m. on Tuesday for the July 15 presidential polls. Several NDA allies, including the BJP, and the Congress and Samajwadi Party are expected to file nomination papers on his behalf in an expression of support for his candidature.

Led by Prime Minister A.B. Vajpayee, the ruling NDA is expected to co-opt some of its key allies for Kalam's nomination. Likewise, Congress President Sonia Gandhi will led a team of senior party leaders in proposing Kalam's nomination.

Prominent Congress leaders likely to sign support for Kalam include Leader of the Opposition in the Rajya Sabha Manmohan Singh, Ambika Soni, Ahmed Patel, K. Natwar Singh, Pranab Mukherjee, S. Jaipal reddy, P.M. Sayeed, Najma Heptulla and Shivraj Patil.

The rules restrict the number of nomination papers that can be filed by or on behalf of a candidate to a maximum of four.

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Accompanied by Parliamentary Affairs Minister Pramod Mahajan, the NDA's presidential nominee arrived from Chennai on Monday morning to a big welcome at the airport. "I have come here on a mission. I will file my nomination papers tomorrow," he told reporters.

Later, when asked about his views on the communal violence in Gujarat, Kalam said, "We have to have a vision of the nation to reduce tensions in the society." As president, he said he would seek to "integrate minds with the system and Parliament".

Kalam had a busy day. He began with meeting NDA convener George Fernandes, then went to the PMs house for a lunch hosted in his honour.

Kalam, already travelling in a four-car cavalcade with tinted windows, also met Mulayam Singh Yadav and Sonia Gandhi and thanked them for supporting his candidature.

Later, he called on President K.R., Narayanan at the Rashtrapati Bhawan.

Kalam looked cheerful as he ate — south-Indian vegetarian fare — with Union ministers L.K. Advani, Fernandes, M.M. Joshi and Mahajan.

Though invited to join the PM's lunch, Sonia Gandhi and External Affairs Minister Jaswant Singh could not be present. The Congress president, however, was represented by Manmohan Singh.

After his meeting with Kalam, Mulayam Singh appealed to the Left Front to withdraw its presidential nominee to ensure unanimous election of the "missile man".

In fact, all through the day, several political parties — including the AIADMK, Nationalist Congress Party, Republican Party of India (Athwale) and the PMK—exhorted the Left Front to withdraw its candidate.

Source : *The Hindustan Times, June 18, 2002.*

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NUKE MAN AS PREZ WILL SEND WRONG SIGNAL

The Left Front's presidential candidate, Dr. (Capt.) Lakshmi Sehgal, believes that a "nuclear man" as the head of the state would send "wrong signals to the international community".

Addressing her first Press conference of the CPI (M) headquarters here on Monday after the Left Front pitched her in the contest against A.P.J. Abdul Kalam, Sehgal said she does not "have anything against Kalam". She "admired him as a great scientist", but a "nuclear man as the country's head of state would send the wrong signals to the world".

Eight-eight-year-old Sehgal walked in to address the press meet along with several Left leaders, including CPI (M) general secretary Harkishen Singh Surjeet, CPI general secretary A.B. Bardhan and RSP secretary Abanai Roy.

After reading out a statement which broadly set out her "secular political belief", Sehgal emphasized that imposition of President's rule in Gujarat, where "recent happenings have numbed the nation", was "justifiable" because "many lives could have been saved".

Sehgal will kick off her election campaign with a visit to relief camps of riot victims in Ahmedabad on June 29. She will file her nomination papers on June 21.

Asked whether a head of state should necessarily be politically experienced, she said: "I don't think any great political experience is needed.... I know exactly what problems the country is faced with and the trying times it is passing through."

When her comments were sought on the unequal contest (between Kalam and she), Sehgal said: "A flight is a fight." She was equally quickly to reply when reporters asked for her reaction on the "desertion" by the Congress and the

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Samajwadi Party. "In every battle there are people who run away from the battlefield".

Pointing out that it would be her "endeavour to protect the secular democratic foundation of the Constitution," Sehgal attacked the Vajpayee Government, charging it with "non-performance". In fact, she went further, saying that "communalism is the biggest danger to the country and that the challenge within greater than it is from outside".

Sehgal's press meet was marred by an ugly incident in which Journalists exchanged fisticuffs after photo-journalists virtually mobbed Sehgal in their eagerness to take photographs.

This led to heated exchange of words. A photographer belonging to a language newspaper roughed up Bardhan who was urging that Sehgal be allowed to leave.

Source : *The Hindustan Times, June 18, 2002.*

COLLEAGUE WIELDS PEN FOR KALAM

Noises heard outside. The garrulous gossips, The deeds of rouges Who do not share the joys. With their lives' goal of Speaking about dividing people. With separate directions for each of them And forgetting the Mother. My friend! Forget the barbs Released by them!

This poem was written for Dr. A.P.J. Abdul Kalam by his long time friend, colleague and associate Dr. Y.S. Rajan, Executive Director of the Technology Information and Assessment Council.

Sample another :

Oh, friend, one who found victory in the life of space, Gave you shape for the five missiles! We saw you shining like Bhisma Why do you, friend, need a marital life When you are here to establish good life in country all over!

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Dr. Rajan says he has been writing poetry for Dr. Kalam since the 1960s when both of them were in ISRO.

In an association spanning nearly forty years whenever they achieved some victory in their scientific programmes and projects, Dr. Rajan penned down some verses and gave them to Dr. Kalam.

Dr. Kalam in his autobiography has written: "I had the fortune of having Y.S. Rajan from the ISRO headquarters as my friend in those times. Rajan was (and is) a universal friend. His friendship embraced with equal warmth turners, fitters, electricians and drivers besides scientists, engineers, contractors and bureaucrats. Today when press calls me a 'welder of people' I look at my experience with Rajan as my filler material and flux."

In an anthology of Dr. Rajan's original Tamil poems *Nenjaga Malargal* (Blossoms of the Heart) there are 14 poems on Dr. Kalam. Dr. Kalam in a foreword to the anthology says it was Dr. Rajan's "poetic temperament which drew us together."

"What do we see in the fourteen poems composed about me? We see that scientific achievements can be described in poetry and sung."

Source : *The Hindustan Times, June 18, 2002.*

UNITY, FRICTION AS A.P.J. FILES PAPERS

Two sets of nomination papers — one by the Congress, the other by the NDA and non-Congress, non-Left Opposition — were filed on behalf of A.P.J. Abdul Kalam at Parliament House on Tuesday.

Over a hundred leaders from across the non-Left political spectrum, led by Prime Minister A.B. Vajpayee and Leader of the Opposition Sonia Gandhi, were present.

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Kalam himself exuded the quiet dignity and aloofness expected of a President-to-be; largely letting the politicians do the talking. He even wondered if the media focus on him was really necessary; and was told by Amar Singh of the Samajwadi Party (SP): "It's an occupational hazard you might have to learn to live with."

But the Missile Man seemed to possess a sense of humous not entirely innocent of politics. At the PM's Parliament House office before the filing of nominations, he was heard advising Mulayam Singh Yadav to learn Tamil. "You can be anti-English but not anti-Tamil," he told the SP boss.

From the PM's office, Kalam's non-Congress, non-NDA backers, including Naidu and the BSP's Mayawati, walked in a procession to the office of the returning officer, Rajya Sabha secretary general R.C. Tripathi. Sonia's team was already there.

On the way, as Mayawati walked with Kalam, TV crew pestered Mulayam to move up front, so that the Uttar Pradesh rivals could be caught in the same frame. The SP chief immediately took a dig at Mayawati: "Let it be, it's her first chance to be seen in Kalam *saab's* company."

"We socialists haven't yet learnt the art of hogging the limelight," interjected Samata Party's George Fernandes, Pat came Home Minister L.K. Advani's retort: If that is so, I'd rather follow the socialists."

As Kalam presented his candidature to Tripathi, the banter, much of it politically loaded, continued.

Amar Singh, on the lookout for 'secular' allies after the divorce with the Left, told Naidu: "I am glad you all Mulayam Singhji are seated so close together." He went on to suggest that after agreeing on Kalam's candidature, the "time was ripe" for them to join hands on other issues too.

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Rajya Sabha deputy Chairperson Najma Heptullah cracked her own little joke.

She could see "three CMs and three PMs" in the room, Heptullah said. She meant Chief Ministers Naidu, Naveen Patnaik and Mayawati, and, apart from Prime Minister Vajpayee, 'PMs' Pramod Mahajan and P.M. Sayeed.

But Heptullah couldn't have bargained for what came next. She had forgotten 'PM' Pranab Mukherjee, Mahajan reminded her. "Pranab*da* might have become redundant in your party, but he's a great parliamentarian whom I cannot ignore!"

Source : *The Hindustan Times, June 19, 2002.*

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supporters with very light braces made of carbon, which weigh just 300 grams.

A vegetarian and a teetotaller, Abdul Kalam recites the Quran and the *Bhagvad Gita* with equal ease. A confirmed bachelor, his modesty is evident from the fact that he gives all the credit to his colleagues. He burst into the limelight after the Pokhran nuclear explosions in 1998. Totally dedicated to the development of the nation, he has been felicitated with many national awards. He was awarded the Padma Bhushan in 1981, the Padma Vibhushan in 1990 and the HK Firodia Award for Excellence in Science and Technology in 1996. More recently, he was honoured with the Bharat Ratna in 1997, the highest civilian award in India.

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– A P J Abdul Kalam

APH PUBLISHING CORPORATION
5, Ansari Road, Darya Ganj, New Delhi-110 002
E-mail: aph@mantraonline.com
Website: www.aphbooksindia.com

ISBN 81-7

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